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The Chemistry of the Bessemer Process.

THE form in which iron first makes its appearance in the arts is usually that of cast-iron. This is an impure species of the metal—the impurities being rendered necessary by the nature of the blast-furnace process, which cannot effect the reduction of the iron from the ore without introducing also certain other elements in the form of alloys or chemical combinations. In order to obtain the malleable iron, which is a nearly pure metal, it is necessary to remove these impurities. Steel is intermediate between cast and wrought iron both in respect to its chemical constitution and its mechanical properties, being iron with a slight admixture of carbon. The order in which these three species succeed each other in their production is first the reduction of the cast iron from the ore; second, its purification or reduction to wrought iron; third, the conversion of wrought-iron into steel, by the addition of a small per centage of carbon. This order is sometimes deviated from, but very seldom with advantage, and never except under peculiar or local circumstances, when it is difficult or impracticable to carry it out. The order given is the normal one; is by far the cheapest and the most rational. We shall not discuss here the blast furnace process, but merely those by which cast-iron is reduced to wrought-iron, and wrought-iron converted into steel. They are many in number, varying widely in the mechanical means, and the materials employed to effect them. But the chemical principles and reactions involved, are not merely similar, but, in most cases very nearly identical, whether occurring in the finery, the puddling, the Bessemer, the Heaton, or the Siemens-Martin processes. What differences occur are—with exception of some specific cases—entirely mechanical, and confined to the mechanical means of bringing these reactions about. The specific cases alluded to, as in some respects exceptional, are those in which some new element is used to modify these reactions, such as the use of furnace powders, or as they are currently termed, "chemicals," or, as the workmen pithily call them, "Doctors' stuff." These sometimes introduce new elements, which give rise to slightly modified reactions: but their use is limited, and, in very many cases, merely involves that principle known to the chemist as the law of substitution; and hence is not so great a modification after all. Let us then proceed to characterize these reactions.

Cast-iron—the raw material from which the malleable metal is made, may be furnished approximately as follows:

Silicon, (Si)	5 to 3	per cent.
Phosphorus, (P)	0.05 to 2	per cent.
Manganese, (Mn)	0 to 20	per cent.
Sulphur, (S)	0.25 to 2	per cent.
Carbon, (C)	2.0 to 5	per cent.
Iron, (Fe)	90.0 to 96.5	per cent.

It is a rare thing if pig-iron do not contain every one of these elements, excepting manganese, in proportions within the limits here given. Although manganese is oftener absent than present, yet its importance is so great in the metallurgy of iron, that I have deemed it necessary to introduce it into the discussion, particularly as its importance is greatest of all in the Bessemer process. The percentages given are neither the highest nor the lowest, but may be considered as the extremes of the normal varieties. Some few extraordinary brands have been known to exhibit very remarkable constitutions, such as eight per cent. of carbon, and twelve to fifteen per cent. of silica, but these are mere curiosities of metallurgy, and not useful or practicable material.

Adverting to the table, the chemist will immediately notice two things: 1. All of these elements are highly oxydizable. 2. The iron is the least readily oxydized of all.

(I have arranged the elements in the order of the readiness with which they combine with oxygen.) What ought we to expect then when cast-iron is subjected, in a fluid state, to the the action of oxygen? First, we may expect that they would all oxydize. Second, that though they may all oxydize, yet, in consequence of the more powerful affinities of some of the elements (silicon, for instance), these would not only consume free oxygen, but would attack the weaker affinities (iron, for instance), decompose them, and appropriate their oxygen also. Now these things are approximately what happen. When iron begins to melt in the puddling furnace, or finery, as soon as an atom of oxygen alights upon the fluid metal, it is taken into combination by one of the elements. If it touch the silicon, it is retained; but if it touch the iron, it is retained only until the molecule of oxyde of iron encounters an atom of silicon, when the latter element instantly robs it of its oxygen and retains it. And this interchange goes on, the iron acting as a sort of carrier of the oxygen, until most of the silicon is satisfied. When this is accomplished a similar process goes on with the other elements, only a small portion of the iron remaining oxydized, because it is compelled to yield its oxygen to its more tenacious neighbors. Last of all the carbon comes in for its share and is the last to burn out.

But let us examine in detail the behavior of these six elements, as manifested in the ordinary puddling process, and thus we shall be able to determine in what respect the Bessemer differs from it, and whether there really is any essential difference. Let us take the elements in the order given, which is the order in which they are eliminated.

The puddling process is performed in a reverberatory furnace, like the one in the diagram, in which the flame plays over the surface of the metal. The hearth is lined with iron ore, or some other oxyde of iron, which furnishes some of the oxygen required for the reaction, the remainder being supplied by the atmosphere carried in by the blast. The metal selected is usually one containing small quantities, both of carbon and silicon, and which melts very gradually, becoming soft and pasty before it melts. The advantage of this slow melting is, that the metal becomes considerably oxydized early in the heat, the successively liquifying portions being successively exposed to the oxygen of the blast. When the charge is melted the first reaction is the oxydation of the silicon, forming silicic acid, which is composed of one atom of silicon to three of oxygen (SiO_3). Now this compound is a powerful acid, and like all other acids, has a strong tendency to unite with some base, provided it can find one—and it does find one very readily. The base with which it will unite must be an oxyde of some substance. If manganese be present, it will, from preference, combine with the oxyde of manganese, but if none be present it will combine with the oxyde of iron. Now this element, silicon, is so powerful in its affinities, that it is not content with robbing every other element, especially the iron, of what oxygen they can get, but even after it has been oxydized, and become silicic acid, its appetite is by no means satiated. In its new form it now proceeds to appropriate and consume oxyde of manganese and oxyde of iron, until every molecule of silicic acid has secured either one molecule of oxyde of manganese or three of oxyde of iron. The resulting product of this silicic acid reaction is a silicate of manganese and iron, which is not subsequently decomposed. It is a very fusible compound, and is the slag or "top-cinder," as the workmen term it. It becomes a kind of broth, or mother-liquor, in which the remaining charge is cooked, and is nearly all thrown away afterwards, only a small portion of it being available for further use.

The next element which undergoes change is phosphorus. The great affinity of this substance for oxygen is well known to you, being manifested by the violent manner in which it burns in the atmosphere. And yet there seems to be great difficulty in oxydizing phosphorus in the puddling furnace, and in the Bessemer converter it does not appear to oxydize at all. This can only be explained by assuming that its affinity for iron is as great, if not greater, than its affinity for oxygen; still it is, to a considerable extent, oxidized in the puddling furnace, and most decidedly so when manganese is present. But it often happens that a considerable part of the phosphorus remains in the iron unchanged. That portion which is oxydized becomes phosphoric acid and ($P O_5$).

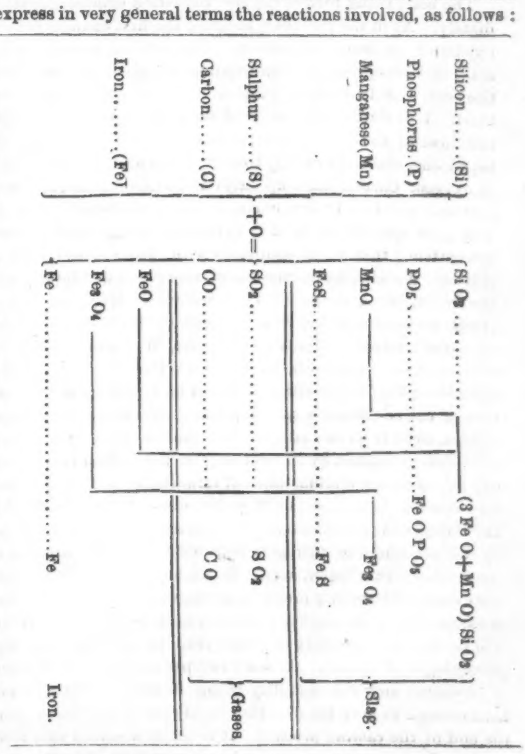
I strongly incline to the opinion that the affinity of phosphorus for iron increases with the heat. In the Bessemer process, where the heat is most intense, the phosphorus is not eliminated in any perceptible degree. In the Siemens-Martin process, where the heat is much greater than in the common furnace, it is removed only in a small degree, the greater portion still remaining as phosphide of iron.

The next element is manganese. This oxydizes most readily, and for two reasons—first, its affinity for oxygen is originally very great, and, second, it has little or no affinity for the iron itself. All of the other elements combine readily with the iron, but manganese generally exists in it as an alloy, ready to leave it at the first breath of oxygen. Moreover, the oxyde of manganese forms a much more stable combination with silicic acid than does the oxyde of iron, and oxyde of manganese will always release oxyde of iron from the slag. Still again it requires only one equivalent of oxyde of manganese to satisfy one of silicic acid, whereas it requires three of iron to satisfy it, and hence, one atom of manganese will save in the slag three atoms of iron. So the atomic weights of both are about the same; one per cent. of manganese saves about three per cent. of iron—other things being equal. This element is of immense importance in metallurgy. It is highly detrimental to the quality of the finished metal, when retained in it, but as a part of the slag, and as a re-agent, it is most beneficial. It may be compared to certain drugs, which are extremely salutary and efficient as medicines, but deadly poisons when retained in the system.

The next element is sulphur. This presents many analogies to phosphorus in its behavior, but fortunately is not quite so tenacious in its affinity for iron. A portion of it is oxydized and disappears in the form of sulphurous acid gas. The remainder, provided the process continue long enough, goes into the slag as sulphide of iron. This tendency is decidedly strengthened by the presence of manganese, which seems on all occasions to act as a healthful tonic, removing impurities by some hidden law not yet comprehended.

The last element is carbon. It is contained in larger proportions than any other, and is the one which determines the character and grade of the metal. So long as the carbon remains, so long does the metal preserve its character as cast-iron, and when the carbon is removed the wrought-iron properties are at once developed, even though other elements be present in considerable quantities. In the refining process it is the last element to leave the iron and its departure gradually and surely changes its character and behavior. After the slag is formed, the oxygen begins to attack powerfully the carbon. The combustion gives rise to carbonic oxide, (CO.) a gas, which escapes through the chimney. In the puddling furnace the removal of the carbon is indicated by the boiling of the bath of metal. The iron ore, or other oxide of iron, used to line the hearth of the furnace, freely gives up its oxygen to the carbon, which, in the gaseous form, escapes upward, occasioning a vigorous ebullition of the slag. This continues for a time, when a singular phenomenon takes place. Cast iron is readily fusible in the reverberatory furnace, but wrought-iron not all so; or, conversely, the heat of the puddling furnace is above that of liquid cast and much below that of liquid wrought-iron. Consequently, as the changes progress, notwithstanding the constantly increasing heat, and as the iron becomes purer, it begins to show signs of infusibility. At length it reaches a state where it can no longer remain fluid, and begins to segregate in granules and lumps out of the slag, in a manner strongly suggestive of that in which butter separates from the buttermilk in the churn. At first it forms spongy, pasty masses, which weld together, gradually growing harder and more consistent as the process goes on. This is termed "coming to nature." The workman endeavors to retard the consolidation as much as practicable, because the reaction of the oxygen is impeded, and finally stopped by it, and it is important to subject the metal to its action so long as any impurity remains, which it is possible to remove. When the process is complete the iron is removed from the slag and subjected to mechanical treatment, in order to express any remaining slag, and to condense the mass, and give it definite workable shapes.

Having thus briefly discussed the behavior of the various elements in the puddling process, we find that all the impurities are removable to a greater or less extent by oxydation. Let us then reduce our results to a kind of formula, which shall express in very general terms the reactions involved, as follows:



This may be interpreted as follows: If the six elements here given be subjected to the action of oxygen, the first five will be mostly oxydized, while the iron will be oxydized only to the extent of about ten or fifteen per cent., the residue remaining in the elementary or nearly pure condition. We may divide the products into three kinds: (1) slag, (2) gases, (3) iron. The gases are carried off through the chimney, the slag remains liquid and is tapped off, and the iron solidifies and is removed from the slag with tongs.

In the foregoing account of the conversion of crude into

wrought-iron, it must not be supposed that we have lost sight of the Bessemer process. On the contrary, we have kept it continually in view, and the descriptions given and the reactions followed out are equally applicable to the Bessemer method. In a word, we have described the chemistry of the pneumatic process, as well as that of the puddling process. Each for each, the reagents are exactly the same, and their behavior almost identical, from the moment the metal is first touched by the oxygen until it receives its final shape in the shingling or the ingot mould. There is not a substance employed, nor a combination induced or resolved, in the Bessemer process which has not been repeatedly made use of for more that thirty years in the commonest practice of Europe and America. The differences, which are many and great, are all *mechanical*, and the Bessemer process may, with strict accuracy, be said to be *the employment of entirely new mechanical methods and appliances for effecting old and familiar reactions.* Let us proceed to the demonstration of these facts.

The gist of the Bessemer process lies in this: that the metal is kept fluid from the beginning to the end—from the time when the metal is first touched by the oxygen until it is finally cast into workable and definite shape in the ingot moulds. This implies an enormous increase of heat during the working, for wrought iron is very doubtfully fusible in the most intense heat of the blast furnace, and not at all so in the reverberatory furnace. But in this method not only is the purified wrought-iron melted into a state of extreme fluidity, but it retains a surplus of heat sufficient to keep it liquid for a considerable time after it has received an admixture of five to ten per cent. of cast-iron at less than half its temperature, and it can still be poured in a thin stream and cast with facility. Indeed no other process known to the arts develops a degree of heat at all comparable to this, and the most surprising thing connected with it is the simple and unexpected means by which it is obtained, of which more hereafter. The cast-iron intended for conversion is selected with reference to qualities which will also be more fully described further on. Suffice it to say here, that it must contain a large proportion of silicon, and be as free from phosphorus and sulphur as possible. It is first melted in a cupola furnace, whence it is run into the converting vessel. This vessel is hung upon trunnions, and through one trunnion receives an air-pipe, which passes down the side of the vessel to a chamber in the bottom. From this chamber the air passes into the main cavity of the converter through a hundred or more small passages called tuyere-holes. The main cavity is lined a foot thick with highly refractory, siliceous material, and previous to the reception of the charge is heated as hot as practicable by burning soft coal in it. The charge of metal used in the converters at Troy, and generally elsewhere, is five tons, or 20,000 pounds, and the blast is forced at a pressure of twenty to thirty pounds. The vessel receives its charge in a nearly horizontal position, in order that the metal may not run through the tuyere-holes at the bottom. When fully charged the blast is turned on and the vessel righted, in which position the upward pressure of the blast prevents the escape of the iron. It is obvious that the blast cannot stop until the vessel has been again rotated, so that the tuyere-holes are, so to speak, "out of water." The descent of the metal into the air-chamber is an accident from which every steel maker daily and devoutly prays to be delivered. At full heat the fluid charge would melt the iron bottom like butter, and display the contents of the converter over the floor in a fiery flood.

The blast being turned on, the reduction commences immediately. As in the puddling furnace, the first change is in the oxydation of iron and silicon. The silicon becomes silicic acid, and enough of the iron oxydizes to satisfy the affinities of the acid, and does not decompose during the remainder of the blast. It is during this stage of the process that the remarkable heat of the conversion is developed. It will be remembered that when silicon oxydizes it takes up three equivalents of oxygen. Carbon takes up only one in this process, becoming carbonic oxyde. It is a common error to suppose that any very great quantity of heat is generated by the combustion of the carbon; that is as compared with that derived from the silicon. An elegant discussion of this point will be found in the November number of *Van Nostrand's Magazine*, Vol. I., (1869) translated by me from *Le Genie Civil*, being the remarks of a distinguished French metallurgist, M. JORDAN, before the Society of Civil Engineers of France. The heat generated by the silicon burning to silicic acid will be found, by the application of the co-efficients and formulæ of the mechanical theory of heat, to be from two and one-half times to three times greater than that generated by the burning of the carbon to carbonic oxyde. Another circumstance of importance is, that the silicic acid remains as a dense fluid in the converter, no part of its heat being lost, except such as is carried out of the converter by the atmospheric nitrogen, and none is rendered latent by converting it into vapor, while the carbon *is* vaporized, a physical change absorbing much heat, and the vapor thus formed is carried out of the converter at very high temperature. Hence will be seen the necessity of employing irons containing high percentages of silicon. At least two per cent. of this element is essential, any less quantity being insufficient to generate heat enough to keep the iron thoroughly liquid and fluent until the end of the casting process. It is often asserted that irons for Bessemer conversion must be "grey irons," as they are called, *i. e.* irons rich in carbon. Now, although this happens, as a rule, to be true enough, it is apt to lead to misapprehension. The fact that Bessemer pig-irons are carbonized varieties is an accident, and not an essential feature. What *is* essential is, that it should contain a large quantity of silicon and very little—indeed the least possible—of sulphur, phosphorus and manganese. Now, a pig-iron containing much silicon and no sulphur or manganese is pretty sure to contain a high percentage of carbon, as all smelters are aware. This fact is a feature of the blast furnace, and almost without exception. If an iron could be produced with much silicon, a little carbon, no phosphorus, it would, I think, be not altogether unsuited to the Bessemer treatment. In a word, the quantity of carbon is approximately immaterial, except so far as it implies proper conditions with respect to other elements. The main element required is the silicon, and not the carbon.—*Troy Press.*

TO BE CONTINUED.

Proceedings of the English Institute of Mining Engineers.

Extracted from the "Colliery Guardian,"

THE UTILISATION OF BLAST FURNACE GASES.

MR. W. FERRIE next read a paper "On the Utilisation of Blast Furnace Gases, Coal being used as Fuel." The utilisation of gases from blast furnaces had, the writer said, for many years attracted the attention of iron-masters; and in the Cleveland district, in particular, the consumption of these gases had arrived at a higher degree of perfection. In districts where raw coal was the fuel used, nothing could be stated as to the results; and it had been said that a Scotch furnace sent twice as much unconsumed fuel into the air as was consumed within it. The difficulty in withdrawing the gases from a furnace using raw coal as the fuel, was that the combustion of the gases at the furnace top was the means whereby the coal was converted into coke, in which state it must be previous to its descent to the zone of reduction. That the gases were in excess of what was required for the coking process, was beyond doubt; but to regulate the withdrawal of them so as not to interfere with the regular working of the furnace had never been done satisfactorily. Were a practicable plan introduced to admit of the withdrawal of the gases, the saving in fuel would be enormous and amounting to something like 600,000 tons of coal per annum over the pig iron furnaces of Scotland. In considering this subject, it occurred to the writer that, if they could coke the coal in furnaces in the same way as coal was coked in the common retorts at gas works, the difficulty would be overcome. He accordingly commenced experiments with a small blast furnace, about the fifteenth capacity of a fifty feet furnace. The upper part was divided into two compartments or retorts, into which the coal, ores, and flux were charged, and the top was closed in the usual way by the bell and cone. The gases passed off into a main which communicated by two pipes, one on each side of the furnace, to the entrance of the flues at the bottom of the retorts, and were ignited by the aid of atmospheric air. These flues were constructed spirally, in order that the heat from the burning gases might permeate the materials inside of the retorts, while the exhaust gases were thrown off by chimneys at the top of the retorts. This small furnace was worked for about two months with raw coal as fuel only, and the results obtained were highly satisfactory, notwithstanding that the furnace was of so small dimensions. The iron produced was Nos. 1, 3, and 4, and that from materials that had only been sixteen hours in the furnace, so great was the rapidity of the "driving" of the furnace. An examination was daily made into the interior of the furnace at the bottom of the retorts, and invariably the coal was found thoroughly coked, and at a high heat, the lime completely calcined at the same temperature, and at a like temperature also were the ores. Being convinced that this plan of working a furnace was practicable, operations were immediately commenced for altering one of the ordinary furnaces at the Monkland Ironworks, on the same plan or nearly so. Mr. FERRIE, with the aid of diagrams, described this furnace, and also another modification of a self-acting coke furnace. The throat of this furnace was contracted in diameter, whilst of a proportionally increased vertical length, so as to form a single retort, which was heated by burning gases surrounding it. He proposed to introduce a portion only of the coal, or, it might be, of coke, into the central retort, along with the ores and flux. The retorts at the outside of the lining were to receive the remainder of the coal which became choked in descending the retorts, which were heated by burning gases in flues surrounding them. These retorts were continued downwards separately from the central part of the furnace nearly to the hearth, so as to keep their contents distinct, and to ensure the coke formed in them being interposed at the hearth between the ores or metal and the blast jets. This plan of furnace was intended to secure that the coke should be at all times between the blast and the ores, and the writer anticipated from such an arrangement and increase in the production of carbonic oxide, a regularity in the smelting process, and a saving of fuel. He had not, however, had the opportunity of putting such a furnace in practice, but he was in the meantime altering a furnace with the view of making the experiment.

EXPANSIVE DOUBLE-CYLINDER PUMPING ENGINES.

Mr. ANDREW BARCLAY (Kilmarnock), next read a paper on "An Expansive Double-cylinder Pumping Engine." The improvement which the writer proposed to effect on the pumping engine was to adopt the double-cylinder, which had been found so efficient for other purposes, and to dispense with the ponderous working beam, and substitute in its stead an overhanging lifting beam, thus doing away with the necessity for the expensive foundations. The principle of the engine was to admit high pressure steam from the boilers into a small cylinder, where it gives its direct power, after exerting which it passes into a large cylinder, utilising the expansive power still left in the steam. In marine or land engines, fitted with double cylinders, this operation went on at both ends of the cylinders; but as the pumping engine was only required to do duty in one direction, the arrangement was different. In it the steam was first admitted to the bottom of the small cylinder. When the piston had reached the top of the stroke, the same steam was admitted at the top of the same cylinder, the engine, being then in equilibrio, descended with its own gravity. When the piston had reached the bottom of the stroke, the steam was all in the top side of the cylinder; it was then admitted under the piston of the large cylinder, where it acted with its expansive force—fresh steam from the boiler being, at the same time, admitted under the piston of the small cylinder. Both of the cylinders were jacketed to prevent condensation, and the other parts of the engine—such as the air-pump, condenser, cataracts, etc.—were got up in the usual way. One effect of the overhanging beam, which was the the chief peculiarity of the engine, was to increase the stroke from ten feet in the large cylinder, and seven feet nine and a-half inches in the small one, to twelve in the pumps. It also dispensed, in a great measure, with the massive beam and masonry required to carry the beam and other parts of the Cornish engine, the force of the steam being exerted in lifting only. This engine possessed all the advantages of the beam engine, and was nearly as cheap as the direct-acting engine, while it did not close up the mouth of the pit. All the building required for this engine was a broad enough base and sufficient weight in the foundation under the cylinder to prevent it from working its way into the ground. The writer further stated that, with the same quantity and pressure of steam, the power of this engine and that of the Cornish engine were almost identical.

Mr. STEVENSON (Airdrie) thought Mr. BARCLAY's engine was just as good as the Cornish engine, but no better. Perhaps it had the advantage of being cheaper; but then it was defective in this respect, that the piston speed was much slower than in the Cornish engine.

Mr. BARCLAY replied that, if he were allowed to put on an expansive slide valve, to make it condensing, to jacket the cylinders, and to cover the boiler, he was perfectly satisfied he would beat the Cornish engine.

Mr. STEVENSON agreed with Mr. BARCLAY in this expectation, but added he was just as confident Mr. BARCLAY would beat the Cornish engine much more by lengthening the bell-crank.

NEW COAL-GETTING MACHINE.

Mr. GEORGE SIMPSON (Glasgow) read a paper explanatory of "A New Coal-getting Machine." He remarked that, while the pumping and winding machinery at many Scotch collieries might be said to be in a fair state of efficiency for the purposes intended, the same could not be said with regard to underground transit machinery. In the drawings and models submitted were embodied the leading features of his views as to face machinery, which may be driven by an engine on the drawing road at the face, or by an endless chain or rope from the surface, or from the bottom of the shaft or other convenient point. In working coal by long-wall by machinery, especially in seams not exceeding two feet in thickness, want of room rendered the existing machines objectionable. By the plan proposed, seams even thinner than two feet thick, without disturbing the accompanying strata, conld be conveniently wrought. In regard to the tools to be used for holeing the coal, durability, despatch of removing and replacing it, in case of blunting or breakage, were indispensable; and in the arrangement shown these had been attended to. In addition to other advantages, there was shown an application of an endless chain for driving the proposed machinery. Of course, considerable friction would result from the intermediate pulley if carried far, but falls from the roof or upheaving of the floor of the mine would not destry the medium of transmitting the power, as in the case of pipes. Besides, it was important to dispense with costly machinery at the face, which in many cases exceeded £150 for each Motur excavator. One fifth part of this sum would provide a complete excavator in the form now proposed, and any number of machines might be used without interfering with the ventilation of the mines. Intervening, blowing, or pumping machinery might be dispensed with, and it was expected that breakages at present arising from the complicated nature of the existing machines would be almost entirely avoided.

MINERAL OIL WORKS.

Mr. DAVID COWAN next read a paper on "Mineral Oil Works." The oil-yielding materials—that is, the bituminous shales and the cannel coals—he said, were plentifully distributed throughout the whole of our Scottish coal measures, but differed very much in character, both as regards the quantity and quality of the produce. To obtain oils from these materials, they were first subjected to a process of destructive distillation, which forms the oils, during which they escape in the form of vapors, while the fixed carbon remains, with the ash, in the distilling vessel or retort. The economy and efficiency of this operation depended greatly upon the kind of retort, the system of heating adopted, the degree of heat applied, and the effectiveness of the condensing part of the apparatus. After giving descriptions of the horizontal and vertical retorts used in the Glasgow district, and discussing the advantages and disadvantages of each, he went on to indicate an arrangement of an apparatus designed to combine the advantages of both. The arrangement proposed belonged to the vertical class, with improvements calculated to remedy the evils attaching to the vertical retorts presently in use. The apparatus necessary was fully described, and it was stated that the vapor did not require to ascend at all—that, although it might partially condense within, it could not return to the hottest part, but must pass downwards to the condensers; and, therefore, whatever loss was due to the decomposition, which was usual from this cause, would, in a great measure, be saved. As to the mode of heating the retorts, it was suggested that, instead of firing with coal, the retorts should be heated with gas flame, as, besides economising fuel and labor, it would meet the requirements of regularity and watchfulness more satisfactorily than the present; and, further, that the system of first converting the fuel into gas (so successfully worked out by SIEMENS) should be adopted. This mode of heating by gas instead of by solid fuel and with hot air supplied to the furnaces, should, besides the other more important advantages of regular temperature, effect a saving

of from forty to fifty per cent. of fuel. The author had also directed his attention towards economising the labor required for charging and discharging the retorts, and with this object in view he had designed an arrangement of machinery for serving the materials to the retorts, which he described along with the other parts of the plant.

The President then thanked the members of the Institution of Engineers and Shipbuilders in Scotland for the excellent arrangements they had made for the reception of the North of England engineers, and acknowledged the kindness and attention shown by the owners of the various industrial works in Glasgow and neighborhood which had been visited.

Mr. ROWAN, President of the Institution of Engineers and Shipbuilders in Scotland, suitably acknowledged the vote of thanks, and remarked the advantages obtained from the exchange of opinions and the comparison of results, by engineers engaged in the North of England and those connected with Scotland.

A vote of thanks was then given to the President, and the proceedings terminated.

In the afternoon, various parties from the Conference visited different engineering, shipbuilding, and coal-mining works in Glasgow and neighborhood.

The Discovery and Production of Gold in California.

[By Professor ROBERT VON SCHLAGINTWEIT.

Translated from the German by ROBERT HEUSCHKEL, M. E.

[Continuation.]

IN the beginning, as I have already said, gold was to be found in masses, and that not only in certain places, but nearly everywhere. Every one was almost certain to find the precious metal wherever his fancy might lead him to travel. But as man is never contented, he moved from place to place, always with the fixed intention of finding still a richer field than the one he had just left. The proverb, the more you have the more you want, proved to be very true.

During the first months after the discovery of gold, the production was carried on not only with the most simple and primitive tools, but also in a very unadvisable and wasteful manner, for the gold-digger's attention was not directed to entire exhausting of the gold field—he knew there was a good many more—his intention was merely to make the largest amount of gold in the shortest time, with the least labor. All deposits that had been worked were once more examined, and many of them re-worked with greater care, after people learned how rough it had been worked before, and after the extremely rich deposits began to fail, the ground that had been washed through twice already, gave a satisfactory yield when washed once more by the easily contented Chinese.

How inexhaustibly rich the California gold deposits are, will be amply proved by a few statistical notes :

The entire production from all the gold mines of California since the discovery up to the present time, that is to say, in a space of twenty-two years, cannot be valued with perfect certainty. The following statement is the most authentic we have : During the year 1848 the yield was ten millions, which gradually increased up to the year 1853, when it amounted to sixty-five millions of dollars. Taking a fair average, we may conclude, that during these twenty-two years nine hundred millions of dollars worth of gold have been yielded by the mines of California. Of course, the value of the gold that has been worked into fancy articles, and that may amount to several millions more, and also of those samples of the original metal that decorate nearly all the collections in the country, is not included in this estimate of minerals. To illustrate to what these samples may amount, I will mention only that a gentleman in Sacramento City, Dr. Frey, has a collection of gold samples, representing a real value of ten thousand dollars. California contains, not only the most extensive and the richest of all the gold fields known, but in consideration of the extremely favorable position, they allow at the same time the easiest working. The gold fields in Australia, discovered in April, 1851, by a California miner, by the name of ED. HARGREAVES, are by far less rich, and less easily worked. Frequently, water, that article so necessary to the miner, is there found wanting, and the deposition of gold is very irregular, so that the mining in that section may be called a lottery, with a few very high prizes, but with more blanks.

The yield of the gold fields of Brazil is gradually diminishing. The northern portion of Siberia, where the richest gold deposits were discovered in 1842, the mining of which had paid in one year 11,250,000 dollars, is, in consequence of the extremest cold, very unfavorable for the development of mining enterprises.

Entirely different are the gold bearing deposits in California. The greatest quantities of gold are found in the western slopes of the Sierra Nevada.

I. In alluvial formations, namely, in the youngest deposits of creeks and rivers, both on the banks and in the channels.

II. In diluvium—i. e., in a somewhat older formation of rivers, that have changed their courses. This diluvium is mostly underlain by primeval rocks (granite), and frequently covered by alluvium.

III. In quartz veins. The two first deposits are called in California, "Placer mines," or, shortly, "Placers," and the third, "Quartz ledges." The placers are worked by hydraulic processes, the ledges, like other mines, by shafts, adits, etc. The placer mines have different names given to them, according to the position in which they are found, namely, whether, in the channel, or on the bank of a creek, or at a distance from a water-course.

The working of placer mines is very simple, provided they prove to be rich ; it requires no practical experience and no scientific education. Any person may learn in a few days the manipulations required in washing the dirt.

The original way of gaining the gold, shortly after its discovery, was the following : The "pay dirt," a material of different compositions, consisting often of a loosely-cemented sandstone, and often of more clayey substances, was dug out by means of a shovel, placed in a pan, and washed in running water. Of course, it requires some exercise to do the washing successfully and quickly. The pan has to be continually shaken, and must not be dipped too deep into the water, as, in that case, particles are washed away, without having had time to deposit the grains of gold they contained. Gold washing is a very weakening occupation, particularly in hot weather, and deleterious to the health, since the workman has to stand partly in water, the hot rays of the sun shining upon him.

A certain quantity of gold is always carried away, as the particles are often so small that they can hardly be seen, or so leafy as to keep swimming, or even the dirt is of such a sticky nature as to adhere to a larger grain of gold, so that it cannot be recognized, and is thrown away as useless ; but the main portion of the gold is, in consequence of the specific gravity, deposited in the pan, mixed with fine blank sand. The larger nuggets are taken away with the hand, the black sand is dried, and either blown away or, sometimes, removed by means of a magnet.

The pan is in use up to this day, but merely to give a gold-bearing deposit a trial. What the test-tube is to the chemist, the pan is to the gold-digger.

Water, and, if possible, running water, is generally absolutely necessary, and only in places where the gold-bearing ground is excessively rich, could it be dispensed with ; but even then great losses are unavoidable. The dirt is brought upon a raw hide, well pounded, and thrown up into the air from a flat vessel, and caught again. The draught of air carries away by and by the dust, leaving the gold. Wind, if not too strong, favors the work.

The results obtained in either way were, of course, extremely variable. The miner often found in one pan gold nuggets to the value of several hundreds of dollars—often, in twenty or thirty pans, hardly one dollar's worth.

An improvement of the simple pan was substituted by the introduction of the so-called "rocker," or "cradle." This is a kind of trough-shaped apparatus, with an inclined floor, overlaid by a sieve. The dirt thrown in the upper part of the cradle is carried away by a continual stream of water, that is allowed to fall from a height of several feet. The heavier particles of gold are left near the upper end of the rocker. The process is facilitated by keeping the cradle constantly rocking.

The "Long Tom," sometimes abbreviated "Tom," is a trough, from twelve to twenty feet in length, being on its upper end one and a half feet, and on its lower part two and a half feet wide. The dirt is treated in the same manner as in the cradle. In general, the Long Tom gives a higher yield.

Neither the cradle nor the Long Tom are in use any more with the white man, but only with the Chinese, and even they use it with considerable improvements. They arrange in proper places cross-lathes, and lay along these small globes of quicksilver, in order to save the fine gold dust, which amalgamates with it, and which was considered a loss in former times. These grains of amalgam were squeezed in chamois leather, to get rid of the free quicksilver. The amalgam is distilled, the quicksilver carefully caught, and used again. It is said that the quicksilver that has been in use already once has a greater affinity for the gold, and dissolves it easier.

The amalgamation is the only chemical process in working placer mines, but the application is so simple that every one can learn it in a few hours, without any knowledge of chemical science.

[TO BE CONTINUED.]

Submarine Cables.

SOME NEW FACTS WITH REGARD TO THEM—WHERE THEY ARE—THEIR NUMBER AND LENGTH—OTHER INTERESTING DETAILS.

IN these days, despite the mail facilities which all enjoy, the demand for a speedier method of transmitting intelligence has become universal—a demand which fortunately the genius of the age is able to supply. The telegraph has become, therefore, an important and essential feature in all land and climes. While but a short time ago it was a costly means of transmitting information, and restricted in its operations to comparatively narrow limits, to-day it girdles the world, and telegraph poles and wires are scattered all over the land. With an increase of its facilities prices have come down to a somewhat reasonable figure, and both the poor and the rich are now enabled to speak with the voice of Jove if they wish to. Every branch of industry has profited by these increased facilities, and no one can accurately estimate the advantages bestowed on men by the discovery and extensive use of the electric telegraph. Armies move at the click of the operator's hammer, and friends converse across oceans as though they were in the same room. At first land wires were the rule, and not until 1851 was the idea of a submarine cable carried into practical execution. Since then the obvious wants of commerce have demanded a greater extent of submarine cables throughout the world. There are already 22,000 miles in active operation, with 27,000 miles of wire. There are 20,828 miles of cable further proposed and under contract. For the former, a capital of about $40,000,000 has been expended ; for the latter an additional capital is demanded of $45,000,000. A late number of the *Banker's Magazine*, to which we are indebted for most of the facts in this article, says, the success of submarine lines being once demonstrated, the demands of commerce for extended systems of submarine telegraphs, are beyond anticipation. As this question is now occupying attention, and much exaggeration and misapprehension exist, it will be instructive to analyze the subject in its present condition, and the more so as English and foreign capital combined is about to complete a circumterrestrial telegraphic communication.

Firstly, the commercial view of the question : Can the existing tariff be so reduced that the benefits of the system will be much more extended than at present? And will this reduced tariff be remunerative? An average commercial message is calculated to be composed of thirty words. Skillful operators can attain a working speed of sixteen words per minute. Of course, upon extended lines differences of longitude render active operations throughout the day feasible, this continuous work being carried on by relays of electricians. But the intervals of transmission and receipt, etc., of messages being considered, the working day is practically reduced to twenty hours. In this period 600 messages can be transmitted. These, charged at the Atlantic Cable tariff, would show a return of $18,000 ; and allowing three hundred working days to the year, one Trans-atlantic conductor, for example, would yield an annual profit of $5,400,000. We leave the deduction to be formed from the above answer to the two questions recorded in the foregoing paragraph. Such facts should be words of confidence to the community where practice has proved the practicability of laying submarine cables. In an interesting table of submarine cables for 1870, we find the following statistics :

Number of cables laid	64
Length of cables, in statute miles	22,007
Miles of insulated wire	27,402
First cable laid in 1851—Dover to Calais	27 miles
Last cable laid in 1870—Aden to Suez	1,419 miles
Longest cable—Brest to St. Pierre	3,014 miles
Shortest cable—across mouths of Danube	3 miles
Cable with most conductors—Denmark to Great Belt, 9 conductors.	
Cables with fewest conductors—38 with one conductor.	

LIST OF CABLES UNDER CONTRACT TO BE LAID.

Name of Company.	Place from and to which Cables are to be laid.	Length of Cable in statute miles.	When to be completed.
Falmouth, Gibraltar and Malta	Porthcurno, near Penzance, to Gibraltar	1,669	
	Gibraltar to Malta	1,195	May, 1870.
Cuba Submarine	Santiago de Cuba Batabana, Cuba	630	May, 1870.
Jersey & Guernsey	England to Jersey and Guernsey	116	May, 1870.
Great Northern, China and Japan Extension Co.	Posietta to Shanghai	1,400	
	And Shanghai to Hong Kong	1,283	July, 1870.
West India and Panama	Cuba through W. India Islands to Surinam, with a branch to Panama	2,975	July, 1870.
Marseilles, Algiers and Malta	Marseilles, Algiers and Malta	1,006	Aug., 1870.
Panama & South Pacific	Panama to Tumbez, in Peru	1,283	1870
British Indian extension	Galle to Singapore via Penang and Malacca	2,049	1870
China Submarine	From a Station in the Straits of Malacca, of the British Indian Extension line, to Hong Kong	1,913	
	And Hong Kong to Shanghai	1,166	June, 1871.
Calcutta & Singapore	Calcutta to Singapore, via Penang and Malacca	2,129	1871
British Australia	Singapore to Batavia	657	
	South Eastern extremity of Java to Port Darwin	1,357	1871
	Total miles	20,828	

—*N. Y. Times.*

Letter from Arizona.

WICKENBURG, Arizona, July 22, 1870.

You hear very little in New York of the Vulture mine, as it is not an incorporated company. Moreover, it appears to be the desire of its owners to keep their affairs as private as possible, and therefore they make no boast of the immense yield of gold bullion constantly furnished from their mill. An idea of its importance, however, may be formed from the fact that about one-half of the currency of Arizona is in Vulture bullion. No inconsiderable portion of the revenue of the company is derived from this circulation, as the bullion passes current at $17 per ounce, which is one dollar per ounce over its mint value. Every one who has a place of business has a pair of gold-scales, and if the proper amount is not tendered and change is necessary, use is made of the cold-chisel. Another source of loss of course arises from the variation of scales. On the whole the bullion currency is a great nuisance, but one that will not be abated until we have more large companies like the Vulture steadily turning out their share of bullion also. At present the demand for labor is so slack in Arizona that the Vulture dictates its own terms. *Mais revenons á nos moutons.* The Vulture mine is fifteen miles from the village of Wickenburg. The mine has been opened to a vertical depth of two hundred and fifty feet, at which point the vein is thirty feet in width. The richest ore at the present writing is taken from the upper shaft, but no experienced miner can for a moment doubt the richness and extent of the mine after a careful examination of its developed ground. The mine has not been opened to show to advantage, as most of the Washoe mines were, but more reference appears to have been had to speedy returns than anything else. A Scotchman, Mr. TAYLOR, is superintendent at the mine, and an excellent superintendent he is. Being satisfied of a permanent position, he has recently brought out his family from the old country. There being no water at or near the mine, the ore has to be hauled fifteen miles, to Vulture City, in order to be crushed. Vulture City is only one mile from Wickenburg, and is named from the Vulture company's mill and works. The mill is a 40-stamp mill, with power for sixty stamps, and is one of the finest on the Pacific coast. The average crushing is eighty tons per day, and I doubt if there is another of its size in the world that turns out more bullion. The hauling of the ore from the mine to the mill costs the company seven dollars per ton ; it formerly cost nine dollars per ton. An escort of United States troops is necessary to protect the freight train from the Apaches, who swarm around Wickenburg and are very dangerous, to freighters especially, as they are very fond of mule meat.

A traction engine and cars are now on their way here from Scotland—an experiment of the superintendent, who saw them work successfully in that country, and who is satisfied that they will reduce the expense of hauling the ore to two dollars per ton. Should this prove the case, in another year the Vulture property will be one of the most valuable on this coast. You will ask, "What does the ore pay?" Of that we cannot speak to a certainty; but we may say that for several years it yielded seven and a half dollars per ton, clear of all expenses. At the time of the erection of the mill the mine was mortgaged to obtain it, but the debt was paid within six weeks from the commencement of its crushing. The general superintendent of the Vulture company is Mr. B. SEXTON, who came out from Connecticut last year for that purpose. Mr. S. was at one time a superintendent of a large factory in Connecticut, and he has introduced the most surprising system in all the company's transactions, thus demonstrating the great success of mining when conducted in a shrewd and systematic manner. The superintendent exercises a fatherly care over his employees, providing for all their wants with admirable foresight. There is a large garden in which most of the vegetables necessary for the mill and mine are raised. The company boarding-house compares favorably with any hotel in the Territory. Should a miner be taken sick he is charged for his board, but only about the actual cost of the provisions consumed by one man—one dollar per day. The usual cost of meals in this Territory is from seventy-five cents to one dollar, and dreadful poor at that. A square meal is a luxury not often obtained. As "hog and hominy" is a favorite dish in some of the Southern States, so "corn-bread and beans" is here—at least in the Prescott section. They are set on the table three times a day, and have come to be considered a square meal. "Give us beans—beans on the square," is a standing order from miners, plug-soldiers, officers, officers' wives, civilians' wives. Even King WOOLSEY, when he invited the Apaches in to make a treaty, set them down to a hasty plate of beans. Since that time beans are unpopular with the Apaches, for WOOLSEY surrounded the party whilst they were seated before the esculent dish, and but few of them escaped. Since this treaty, known as WOOLSEY's Treaty, they have declined any further bean dinners and further treaties.

But there are other big mines in this Territory besides the Vulture. ROSS BROWN, in his report, speaks of the Conquest mine, near La Paz. This mine was for a long time considered richer than the Vulture, but the latter fell into the hands of an energetic set of men, who went to work to develop it, while the former, being the property of one man, was allowed to remain almost idle for several years. The Conquest shows much free gold in the surface ore, and has several shafts on it. Ore was recently shown here and in Prescott that goes over $1000 a ton. The Conquest is not in the Apache country, but it wants a mill badly. Were it up here there would be more excitement about it.

About four months ago a few very rich gold-bearing veins were discovered near Date Creek, twenty-eight miles from Wickenburg, between that place and Prescott. This vicinity has always been an Apache stronghold, and on that account a camp of United States troops is close by. To leave the road or camp for the mines an escort is absolutely necessary for safety. The locations made, with the little work done on them, prove that this district will be an important one at no distant day. Free gold-bearing rock is common enough in Martinez, in good-sized ledges, cropping out well above ground. No doubt the ledges would have been discovered long ago had it not been for the Apaches, who will be for a long time a great drawback to the district.

I close this letter by giving a few notes as to the route from San Francisco and cost of travel: San Francisco to San Pedro, steamer fare $20, time four hours; San Pedro to Los Angelos, railway fare $2 50; Los Angelos to San Bernardino, daily stage, sixty-five miles, $5, ten hours; San Bernardino to Prescott, Arizona, (stage leaves every Thursday morning, via La Paz, Wickenburg and Date Creek, arriving at Prescott, four hundred and ten miles, the following Wednesday noon) through fare $80; San Bernardino to La Paz, one hundred and seven miles, $35; La Paz to Wickenburg, one hundred and twenty miles, $25; Wickenburg to Date Creek, $10; Date Creek to Prescott, $10. The stages make excellent time, considering the road and the distances between watering stations. There is no danger of Indians till near Wickenburg. MACOOP.

MINING SUMMARY.

Colorado.

THE STEWART SILVER REDUCING COMPANY.

The reduction works of the Stewart Silver Reducing Company, located in the lower part of Georgetown, are about to commence operations, and a brief account of their extent, capacity, etc., will doubtless be of interest to many of our readers. To give an idea of the size of the works we would state that they cover 142,000 square feet of ground, that 175,000 feet of lumber, 145,000 brick, 500 bushels of lime and 800 perch of stone work were consumed in their erection, and that over 6,000 cubic yards of excavation were necessary for the foundations, etc. The mill is built after designs furnished by CHAS. MARSHALL, the plans and specifications being made by J. O. STEWART, and the mill is a model for convenience of handling and facilities for cheap working of ore.

MACHINERY.

The machinery, weighing 98 tons, was made at the Eagle Works, Chicago, after drawings of the best Nevada machinery used in the treatment of silver ores, and for good material, fine finish and perfection in workmanship is worthy of the shop that furnished it. There is a fine 100-horse power steam engine, with two large tubular boilers, which furnish power for crushing the ore. The ore, after having been deposited in the ore-house, which has a capacity of 200 tons, to await its turn in treatment, is first passed through the Dodge crushers, two in number, and is then spread on the drying floors, which are heated by the escaping heat from the furnaces. After drying, the ore is weighed and conveyed, by means of a car, to the batteries of the

TWENTY STAMP MILL.

This part of the crushing machinery is perfection itself. The stamps have high batteries and double discharges, and the four batteries, of five stamps each, are so arranged that any battery can remain idle without interfering with the others. Each stamp weighs 650 lbs., and crushes the ore dry to the desired degree of fineness to insure perfect roasting and thorough chlorodizing. The crushed ore passes through a screen of fifty holes to the linear inch and falls into the pulp closets, from which samples are taken to determine its value. The pulverized ore is then placed in a car, and by means of a large Fairbank's scale is weighed—all done while the car is on the track that leads to the

FURNACES.

These furnaces, six in number, with room for four more, are good specimens of first-class reverberatory furnaces, and it is in their fiery depths that the subtle changes that convert the sulphide of silver into chloride occur. When this operation is completed the ore is drawn, spread on the cooling floor, and from thence conveyed in cars to the

AMALGAMATING ROOM.

This department of the mill, on the same floor with the furnaces, contains ten Varney pans and five Varney settlers, in which the chlorodized ore is amalgamated and the quicksilver and amalgam separated from the pulp. After amalgamation the quicksilver is strained and if the amalgam is not sufficiently fine it is refined by the "Marshall process." The amalgam is then retorted, assayed and melted, and the bullion makes its appearance, ready for market, in the form of silver bricks. The mill is a complete one; in addition to the main building there is an office, 16x16 feet; assay room, 16x 20 feet, containing two muffle and two melting furnaces; a laboratory, 6x14 feet, and a sleeping room, 8x8 feet. A fine mill-dam and a race, 650 feet in length, furnish the water power necessary in the amalgamating room. J. O. STEWART, President and General Superintendent of the company, will conduct the business in Colorado, while CHARLES MARSHALL, one of the best of our mill men, will be the foreman, with CHARLES MOOR as assayer. The capacity of the mill, when the four furnaces not yet built are completed, will be twenty tons per day, and we sincerely hope that this mill, with its large capacity for treating ore and producing bullion, will not be allowed to remain idle for want of ore to treat, as it is a magnificent exemplar of the faith of Mr. STEWART and his friends in the extent and richness of Colorado's ore veins, and is deserving of success.

THE SILVER MINES OF GRAND ISLAND DISTRICT.

A telegraphic despatch to the Associated Press from Denver City, August 29, reads as follows: The Central City *Register* furnishes the following items concerning the new silver regions recently discovered north-west of Denver, and already creating intense excitement in mining localities. Persons are starting from Denver with stocks of goods, and there seems to be no doubt of the permanency and richness of the mines. "CENTRAL CITY, Aug. 29.—Our reporter has just returned from Grand Island. The district is located fifteen miles north-west of Central City, on the western boundary of Boulder County, and forty miles from Denver. About thirty ledges have been struck, and six or eight uncovered, showing true fissure silver veins, bearing pay-rak crevices from two to five feet in width. Cariboo, Idaho, Boulder County, Grand Island, Sovereign People, Carter, Trojan, Monitor, Conger and Comstock are among the most celebrated mines. About five hundred men are on the ground. Buildings are going up rapidly. Tons of rich ores are hauling from the mines to Professor HALL's Smelting Works at Black Hawk, daily. Three regular coaches run from here each day, besides many private conveyances. The passengers number about one hundred per day. The excitement is great, and steadily increasing. The veins so far developed give the impression that this is one of the richest silver regions yet discovered on the continent. Prof. HALL contemplates the immediate construction of additional smelting works, to meet the increasing demand from these mines, and other companies are also talking of erecting smelting works."

These mines are not a new discovery. Is the agent of the Associated Press fishing for gratuitous advertising through the metropolitan press in the interest of some mine-owners in Grand Island District? The following account of these mines is from the Central City *Herald*, Aug. 17:—"Mining and prospecting continues lively, and the future of this locality seems to be all that could be wished. Its richness as a silver bearing district is now assured. Old miners say it is equal, if not superior, to Georgetown in that respect, with the advantage of the mines being much more easy of access. This district is peculiarly fortunate in that as well as the enduring nature of the veins. The ore does not run in pockets as in many other places, but the crevices are generally rich as well as large and reliable, and continue to improve as a greater depth is reached, in width, or richness, or both. The last 'big thing' was discovered a few days since, a short distance back and west of Cariboo City, by WILLIAM WARNER, operating with Messrs. JENNESS, WESTOVER, CHAPLINE, HENSELEY and SPILLERS, of Black Hawk. The first surface quartz found assayed $1,500 to the ton, but that taken out yesterday was much richer, containing a large amount of brittle silver, and much resembling the ore taken from the Cooley mine. The quartz is richer than any previously found in the district. CHARLES HAVENS claims to be a party in the above discovery. This lead created quite an excitement in Cariboo, and a large number of prospectors are hunting for its extension. At a depth of seven feet the pay vein is twelve inches wide, with six inches almost wholly composed of brittle silver.

"Several new houses are going up in town and the influx of transient visitors within a few days has been large. The Cariboo mine is improving in the quality of its ore. The last load taken out from the drift gave a yield of $300 to the ton. The crevice from which it was taken has widened to 2½ feet. The trench between the new and old shaft is to be timbered over so as to obviate the trouble from bad air in the main shaft, which has again become annoying. SPENCER, MORKHART and FAIRBURN have sunk the 'Unexpected' lode to the depth of 27 feet, and are now taking ore from the 'Columbia,' which gives evidence of being one of the best lodes on the mountain. Many of the leads here, as elsewhere, which have not been developed, will doubtless prove to be rich when worked.

"A new wagon road is being built from the Cariboo mine *via* the 'Boulder County,' and 'Trojan,' to connect with the road from Pugh's lode to Boulder creek. This will lie to the north of the present road to Cariboo City. Its advantages over the old road are, saving of distance and an easier grade, while most of the leading mines are taken within its course. It will for these reasons secure nearly all the travel to and from the mines to the Boulder. The lower portion is already built by PUGH, and others, while the work of falling trees and grading for the enterprise is being pushed ahead rapidly on the upper part by CARTER & COMPANY, ALLEM & COMPANY, and by the owners of the Cariboo.

"We are told that Mr. CUTTER will put up smelting works at once, at the nearest practicable point to the mines. This will make a large saving in cost of transporting ores. The mines will certainly furnish all the ore necessary to supply works of the kind. Mr. TUCKER is also getting ready to build a saw-mill on the Boulder, near the mines. Heretofore great difficulty has been experienced by the people of Grand Island in receiving mail matter with regularity. This will now be obviated by PATTON & BEEBEE's tri-weekly express, which plies regularly between Central, Black Hawk and Grand Island. The express leaves CHASE & SEARS' store at 7 o'clock, A. M., on Mondays, Wednesdays and Saturdays—arriving in the mines at 12 M. Returning, leaving the mines on Tuesday, Thursday and Saturday mornings. Passengers, freight and packages taken at reasonable rates, and all mail matter taken over regularly.

"The Boulder county lode, one of the most valuble yet discovered, has a 2½ foot crevice, one side of which is rich in gold, and the other still richer in silver. As a greater depth is reached on this lode, the gold seems gradually to be running out, and the silver increasing in quantity. In much of the ore gold has been found associated with large flakes of silver. Some of the finest specimens we have ever seen are constantly being taken from the mine, on which brittle and wire silver are visible in large quantities, with a smaller sprinkling of gold. The value of the ore is changing as the work of sinking progresses, from galena to brittle silver and sulphurets. The highest assay yet obtained from this lode is $12,000 per ton. No ore has yet been treated, for want of a wagon-road from the mine. The road is now completed, and ore will at once be sent to the California works below Black Hawk. The lode is situated on Boulder county or Pugh mountain, (really an extension of Conger or Cariboo mountain.) It is over a mile from Boulder creek, and three-fourths of a mile below the Cariboo, by the new road now building. FULLER's 850 feet of this lode has been bonded to Mr. CUTTER for $8,000. Conger's, together with the Poor Man's lead, and all other mining property owned by him in the district, is said to have been bonded to Mr. CUTTER for $20,000. The lease of Messrs. ALLEM, SLAUGHTER & CRESSMAN, of 50 feet, and of Mr. BURNS, of 150 feet, (from FULLER,) remain intact for the remainder of the fifteen months specified in the same. Mr. J. F. ALLEM is acting as agent for Mr. CUTTER for the property purchased. ALLEM & Co. have also leased 100 feet on the Poor Man's for three years.

"The Trojan lode is situated a short distance below the 'Boulder County,' of which it is supposed to be an extension. It is owned and worked by G. W. CARTER & Co. They are sinking steadily, and have reached a depth of 30 feet. The crevice varies from 2½ to 4 feet in width, widening towards the west end. This lode gives indications of being very rich, and, like the 'Boulder County,' shows fine gold and silver.

"The Sovereign People lode has vastly improved during the past week. At a depth of 18 feet, the pay vein is 17 inches in width, composed of rich sulphurets with much brittle silver. This will show a far higher return than the first one treated, which yielded about $300 per ton. Three men are employed in taking out the ore, and a like force will soon be engaged in sinking a second shaft further to the east on the same lode. NAT. EDWARDS & Co., are working what is believed to be an extension of the Sovereign People lode, and of course have a good thing in prospect. SAM FLANAGAN is working the 'Lily of the West,' a few hundred yards south, and is sanguine of meeting with rich pay.

"JOHN BAKER has discovered several valuable lodes in this district. One of them, situated very near the range, and south-east of Silver Peak, the highest mountain near the mines, has a four-foot crevice of fine-looking ore. He has also three lodes, a mile and a half below, and east of the Cariboo mine, and three-fourths of a mile south of Pugh's, viz: the Ohio, Indiana, Kentucky, and Eva lodes. They are situated from one-half to one-fourth of a mile south of the Cariboo road. The Kentucky ore is of a greenish cast, from a crevice three feet wide. The Indiana has a four-foot crevice, and, as far as developed, gives indications of rich pay. The Ohio has ore very like that of the Cariboo, with an eighteen-inch crevice. The Eva prospects well. We saw native silver smelted from this quartz with a blow-pipe. The lode has a three-feet crevice. Work is being pushed ahead rapidly on all these lodes."

Idaho.

THE SNAKE RIVER MINES—DISCOVERY AND FIRST WORKING OF THE MINES—CHARACTER OF THE COUNTRY—CAUTION TO IMMIGRANTS.

A correspondent of the San Francisco *Bulletin*, writing from Shoshone City, Idaho, July 15, communicates the following information in regard to the Snake River mines:—"Having made a personal examination of the mines on this, the Lewis (or as it is now more commonly called the Snake River) for a considerable distance in the vicinity of this place, and learned much concerning those elsewhere along it, I forward the results of those observations and inquiries to the *Bulletin*, in the belief that this publication may at the present time prove of some service to the mining and trading public. From the number of men who are arriving upon this stream from almost every quarter, it would appear that these mines are attracting rather more attention than they deserve among this class of people; giving ground that more of them will be drawn hither than can find remunerative employment, or, otherwise make it profitable, for while the auriferous bars along it are known to extend from its mouth almost to its source, a distance of nearly 1,600 miles, they occur only in spots; while they have not, except in a few instances, been demonstrated to be either rich or extensive.

FIRST DISCOVERY.

The discovery of gold on this river is by no means a recent thing, having occurred, along its lower portions, soon after the opening up of the mines in the Boise Basin, and further down, about Lewiston, somewhat earlier. The extreme fineness of the particles, however, it being what is denominated 'flour dust,' prevented these diggings being worked at that day, the means for saving this excessively fine dust, having been less perfect then than at present; a further reason for their neglect being that much better wages could then be made almost anywhere in the mines of Eastern Oregon and Idaho than here. It has been the case, however, that small parties have for several years past worked occasionally on the bars in this vicinity, as well as a few points still higher up. In the summer of 1864, a well appointed company left Boise to prospect the Upper Snake and its tributaries; but, meeting with resistance from the Indians, they were obliged to abandon this purpose, having only ascertained that there was at least a show of gold along the streams in that region. Ever since these attempts have been annually renewed, only to end for the first two or three years, in similar results, no considerable amount of work having been accompliahed, until last year in that

quarter. Through these persistent efforts, prosecuted both from the east and the west, the main stream has been traced and examined quite to its source, in the Wind River Mountains, while the most of its upper tributaries have also been pretty effectually explored. On nearly all the bars, both on the two principal forks as well as the confluents, gold has been found—always excessively fine and generally only in limited quantities—nowhere in very great quanties.

FIRST WORKINGS AND RESULTS—STAGES OF WATER, SEASONS, ETC.

Owing to dearth of water, and consequent difficulty in working the mines throughout Idaho last year, a larger number of men than ever before were tempted to try their luck on this river, the most of whom located in this neighborhood, where several good bars had previously been found. Arriving at a time when the water had reached a tolerably low stage and having the culling of the ground the most of them made fair, and a few very large wages. Scarcely any of these men made less than five, while quite a good many took out from ten to fifteen dollars daily. Occasionally as much as fifty or sixty dollars were worked out by two men with a single rocker, and it seems likely that the individual earnings of the forty or fifty men strong along this section of the river were not less than seven or eight dollars per day. The Bascon claim, situate on the north side of the river, quarter of a mile below this place, yielded at the rate of $20 per day to the hand throughout the season; and two men are said to have taken out $175 in one day. This, however, occurred but once, and the claim in question is admitted to have been much the best of any in this vicinity or anywhere else along the river. The average earnings of those at work any considerable distance either above or below here are generally estimated to have been about $5 per day; the entire number of men engaged in working last fall on bars above the old diggings having been about one hundred.

The water in this river reaches its lowest point late in the autumn, at which stage it remains until about the middle of April, when it commences to rise, and, going up slowly at first and more rapidly after two or three weeks, reaches its greatest height towards the latter part of June, when it again begins to subside, going down at the rate of two or three inches daily thereafter. While it is true, as a general thing, that the lower the water the better the diggings, it is still the case that a few of the larger and more elevated bars can be worked to best advantage when the river is high, as at present, hence a small number of men are now engaged working on these exceptional spots, their earnings running, as near as I can ascertain, from three to four dollars per day. On two or three claims, however, I have found them doing better than this, the owners paying their hands, in one case, five, and the others four dollars per day, with board. As the river recedes more men are getting to work, though it will be three or four weeks yet before any considerable number of claims can be worked to advantage. Meantime, there are a goodly number of men here out of employment; and being also out of means, some of them are dependent on their neighbors for their daily food, and there would be no difficulty in finding numbers of good hands willing to work for their board, were there any one desirous of employing them on those terms. Discouraged by this state of affairs and a shameful monopoly of the best grounds by the early comers, held under claims of unusual dimensions and pretended sales, a great many have left the mines, the arrivals on the river at this point being just now scarcely in excess of the departures from it. In fact, there is nothing to be gained in being here at present, the middle of August being about as soon as the river can be prospected and claims located to advantage. From what has been said it will be seen that the best season for work here extends from about the first of September to the latter part of November, during which the water is constantly receding. Early in December—though sometimes not before Christmas—the weather becomes too cold and stormy for successful operations, continuing so with short intervals till about the first of March, when work can be resumed and kept up without much interference from cold or high water till near the middle of May.

The seasons here are about the same as in the State of Nevada—hot and dry summers, with cold winters and deep snow on the mountains, though but little falls along the river or in the adjacent valleys. The autumn and later spring months are pleasant, with but little stormy weather. Miners can winter on the river without much hardship; and as a good deal of work can be done to advantage, it is likely that many will tarry here till spring, prolonging their sojourn till the next rise of water sends them away. Although there is no timber on or near this part of the river, enough of drift wood can usually be obtained for fuel; and at many points also for the construction of cabins, although the latter can readily be made of rocks and other convenient materials.

CHARACTER OF THE RIVER AND ADJACENT COUNTRY.

The river, when high, is a large stream, carrying a volume of water equal to the San Joaquin or the Sacramento. For a good part of its course it flows through rocky and precipitous cañons, its banks for fifty or sixty miles in this vicinity consisting of nearly perpendicular walls of volcanic rock. Its current, wherever it is narrow and thus walled in, is swift, being at many points hastened by falls and rapids. At this place there is a cataract one hundred feet high, and four miles below, another, the Great Shoshone Falls, two hundred and ten feet in height, with several violent pitches in the river immediately above them. There are no trees along this stream, except a very few cedars along the Great Falls, lower down the mountains whence it issues two hundred miles above. The country along it is also treeless—everywhere extremely barren. the bars in the cañons, where only as yet much rich dirt has been found, are generally small and narrow, and being covered for the most part with immense big rock, will afford but comparatively little auriferous earth, while they will be difficult to work. The river water is of good quality, and though cool earlier in the season, is now growing warm, owing to the great distance it has to traverse the hot and arid plains after leaving the mountains.

POPULATION, PROSPECTS, DISCOVERIES, ETC.

Everything considered, there would seem to be as many people now on this river as prospects would warrant. At all events there is, for the reasons stated, no hurry about getting here just yet. The miner who was unable to come in time to avail himself of the opportunities afforded by the low stage of water in the spring may as well postpone his coming for another month or six weeks yet at least, as he will then arrive at a period when he can examine the mines with satisfaction, and soon determine whether it will do to remain or not. But little can be done and not much known of the diggings by actual test earlier than that. Meantime the weather here is dry and hot, provisions rather dear, and life in every respect about as cheerless and uncomfortable as it well can be. Without lumber, there are no houses to protect one from the sun which glares fiercely down the live-long day. It is difficult to ever find enough brush to constitute a shade, the best refuge from the heat being the caves, here numerous, or the shady side of a rock.

IDLERS, GAMBLERS, AND ROUGHS GENERALLY.

It is a peculiarity in affairs here that—all being impressed with the idea that their stay will be short and business evanescent—no improvements of a permanent kind have been or seem likely to be undertaken. No houses or other buildings are put up; no roads or ditches constructed; no farming or mechanical pursuits engaged in; and, in short, no work of any kind except mining to be done—and just now we have seen but little of that. Hence the river is swarming with unwilling idlers; and, what is worse, there are a great many worthless characters gathered in from the outside camps of Idaho, Montana, Utah and Nevada, where they had been leading shiftless and vagabond lives. With this element in the ascendency, quiet and industrious men are obliged to submit to many outrages and indignities, as well as to the unjust monopoly of the mining grounds before alluded to. Drinking, carousing and gambling in a small way constitutes the principal pastime of this class of men, occasional robberies being also perpetrated by them.

TOWNS, TRADING-POSTS, SUPPLIES, ETC.

The place whence I write, Shoshone City, the largest hamlet on the the river, consists of four canvas shanties and a tent, all used as trading posts. At present, they are, with two exceptions, located on the high bluff overlooking the river, though the most of them are to be transferred, in a few days, below, nearer to the mines, a rude wagon road having been gouged out of the cliff to facilitate the work of renewal. At the mouth of Dry Creek, fifteen miles above here, there are four stores and a restaurant, which, with some half-dozen miners' tents, constitute the bulk of that town. There is also a store at Clark's Ferry, twenty miles below here, there being three or four additional trading posts scattered along this portion of the river. At these places miners' supplies of all needed kinds can be procured and generally at fair prices; wherefore it is hardly worth while for parties coming here to encumber themselves with provisions or other dunnage. Fresh beef and mutton can also be had at reasonable rates, while the river affords trout, salmon and other inferior fish in considerable numbers.

ROUTES OF APPROACH, COST OF TRAVEL, OUTFIT, ETC.

In coming to these mines parties from California and Nevada will keep the railroad to station nearest the points on the river they wish to arrive at, such as Elko, Humboldt Wells. Kelton, etc., at all of which places teams can be procured to bring them in at rates varying from $8 to $14 per man, with an allowance of one hundred pounds freight each. At Elko horses can be obtained for riding, while from Kelton a stage leaves daily for the river. Parties coming from the east will, if intending to reach the river at any considerable distance above here, leave the railroad at Corinne. If destined for this neighborhood, they will leave at Kelton. From Corinne there is a daily stage to Taylor's Bridge, one hundred and fifty miles; teams and animals can also be procured there on reasonable terms. From Idaho and Montana this river can be conveniently reached over the several wagon roads leading in from Boise Basin, Rocky Bar, Virginia City, etc. As regards outfit, the miner requires but little, and had best get the most of his supplies on the river. The rockers used here being of peculiar construction had best be obtained in the railroad towns or of the traders here. As animals will be required for prospecting it would be well to purchase them on the railroad, or wherever they can most conveniently be found on the route in. To make certain of having them when wanted it would be prudent to bring along packing and riding gear from places where they can be bought cheapest.

IN CONCLUSION,

I would say to miners and others in California or elsewhere, who are earning even the most moderate wages, remain where you are—$2 per day with steady work in that State is better than $5 here—loss of time and cost of travel, the shortness of the seasons and the discomforts of life in this section of country considered. But there is no certainty that a man can earn $5 per day, or half that sum, or even get work at all when they reach here. Quite a good many first-class miners have already left, satisfied that the chances were poor for earning even living wages. Men whose opinion ought to be considered good authority tell me that they do not think daily wages will exceed $3; and although the Chinese are now prohibited from owning claims or working on the river under the laws of the various districts, many believe that extensive sales will be made to this people the coming winter, and that many bars will be abandoned to them next season. Taken altogether, I can see no inducement for men coming here, while the arguments against any further immigration are numerous and cogent.

SPECIAL SCIENTIFIC BREVITIES.

Alloys.—M. RICHE, in his researches on alloys, finds that tom-toms and cymbals are made of bronze that can be worked cold, the same as iron or aluminium-bronze. The best tone is produced by an alloy, composed of seventy-eight parts of copper and twenty-two parts of tin.

Analytical Discovery.—According to *Cosmos*, the vapor which is frequently disengaged on the first application of heat to the oxide of copper in the combustion tube, used in organic analysis, arises from the presence of a small quantity of selenium. M. VIOLETTE is credited with the discovery.

Cheap Substitute for Platinum.—M. COTELLE, says the *Pharmaceutist*, has invented a cheap substitute for the platinum still used in distillation of sulphuric acid. It consists of a stone tower, into which the acid drops in small quantities, while a current of hot air enters at the bottom and drives over the acid, which is condensed in the usual way.

Delicate Test for Arsenic.—A new and very delicate test for arsenic has been discovered by BETTENDORFF. Its sensibility is so great that it is said to be capable of detecting one part of arsenic in a million parts of solution: and the presence of antimony does not affect it. In order to apply this test, the arsenious or arsenic liquid is mixed with hydrochloric acid until fumes are apparent, thereupon chloride of tin is added, which produces a basic precipitate, containing the greater part of the arsenic as metal mixed with oxyde of tin.

Chinese Bronze.—From a communication recently made to the Academy of Science in Paris, we learn that Chinese bronze, such as is used in the making of gongs and other objects, which are almost as brittle as glass when cold, can be hammered or rolled with the greatest ease at a dull red heat, the best alloy for this purpose containing about ten per cent. of tin. The facts here mentioned are supposed to have been known to the makers of bronze implements during the so-called bronze period, and to the artificers of the buried Italian cities; but, excepting in China, they do not seem to have been put to any practical use in modern times.

ON DIT ABOUT MINES AND METALS.

Good Placer-Diggings are reported to have been struck on the borders of Lower California, below San Diego.

California.—The Mount Diablo coal mines produced, from June 1st to July 1st, 1870, 65,792 tons of coal, against 73,198 tons during the same period last year.

The McLean Co. (Ill.) Coal Company have struck a third vein of coal at the depth of five hundred and thirty-one feet. It is three feet eight inches thick, and of the very best quality.

The Magnetic Iron Company continue their explorations south of Lake Michigammi, and, it is said, have the most cheering prospects of a good mine. The ore is a rich magnetic, very similar to that of the Champion.

Sutro Tunnel.—On the 10th ult., the Sutro Tunnel was in 1,335 feet. They are still running in porphyry. But little water is now coming in. The rock is not very hard, and the workmen are able to make about five feet per day.

Mining Assessments.—The Empire Mill and Mining Company have levied an assessment of $6 per share, delinquent on the 8th September; and the Crown Point Mining Company, $3 per share, amounting to $36,000, delinquent on September 6th.

The Portland (Me.) Rolling-Mills, during the past year, made 18,050 tons of finished rails, being an increase of 1,866 tons over the previous year. There were used at the mill during the year 4,900 tons of pig-iron, 11,000 tons of old rails, and 12,000 tons of coal.

The National Glass Manufacturing Company, with a capital of $100,000 have just erected their works at Bellaire, Ohio, and will shortly be in operation. The Belmont Glass Works are in active operation, employing ninety-five hands, with a monthly pay roll of $4,000.

The Brazil (Ind.) Iron Furnaces.—The *Miner* says: "The Brazil Furnace, the only one now in blast, will blow out in a few days. We notice that fire-brick have arrived to repair her, and trust it is an indication that she will soon resume work, although the want of a market and low prices of metal, do not give us much assurance of an early resumption of business with our furnaces.

California and Nevada Mining Dividends.—The following dividends were divided at San Francisco during July:

	Rate.	Amount.
Argenta Mining Co.	$00 75 ₱ share	$10,500
Chollar-Potosi Mining Co.	1 00 ₱ share	28,000
Eureka (Cal.) Mining Co.	7 50 ₱ share	30,000
Hale & Norcross Mining Co.	5 00 ₱ share	40,000
Union (Cal.) Mining Co.	1 00 ₱ share	5,000

The Vieille Montague Zinc Company, near Aix-la-Chapelle, Prussia, employs upwards of six thousand work-people, who receive annually 3,638,900 francs—$727,780, which gives an average of 606 francs, $121, each. The property of the company, several square miles in extent, is situated between Liege and Aix-la-Chapelle. The whole district is dotted with smelting and other works, and pierced with shafts, presents a scene of industry on a gigantic scale. Zinc and lead are mined, dressed and smelted, purified, alloyed and manufactured on the spot. The dressing works of this section are perhaps the finest in the world, which may be inferred from the fact that they can make quite a clean separation of galena pyrites, zinc blende and gangue.

Poisoning by Blast-Furnace Gases.—Dr. PERCY, of the Royal School of Mines, Jermyn street, writing to the *Times*, says: "It is reported that four men have been killed at iron works in North Staffordshire, by what is termed 'waste gas from the blasting furnaces.' The poisonous ingredient of that gas is carbonic oxide, and the inhalation of it in very small quantity, whether pure or mixed with common air, rapidly destroys life. I have collected and published several cases of fatal poisoning from that cause at iron works, foreign as well as British. A few years ago, the engineer of the Dowlais iron works was suffocated in his office by the escape of this gas from an adjoining culvert. It is important that the managers of such works should be acquainted with its highly poisonous nature, and take every precaution to prevent their workmen from being exposed to its influence. As the use of waste gas from our blast-furnaces for heating steam-boilers, mine-kilns, etc., is extending daily, it is to be feared that deaths from its inhalation may become more frequent than hitherto, unless those who deal with it are fully instructed concerning its action on man. With the hope of communicating such instruction as widely and as quickly as possible, I beg to submit this letter for your consideration."

MISCELLANEA.

Geology.—Prof. HITCHCOCK of Amherst College, has discovered evidences of the action of Icebergs on Mount Washington, N. H., 5800 feet above the level of the sea, being several hundred feet higher than the traces noticed by any other observer.

A Revolving Hotel.—A clerk in an Erie hotel has a magnificent scheme in view. It is a circular hotel, to rest on a pivot like a locomotive turn-table. The object is to give every guest a "front room," (that being an almost invariable request) by assigning guests to the places then in front, and turning them to the rear upon the advent of others.

Nicaragua and Tehuantepec Canal Survey.—Congress at the late session appropriated $20,000 for an examination and survey, under direction of the President, of the routes of Nicaragua and Tehuantepec, in order to ascertain the practicability of a ship canal at these places, between the Atlantic and Pacific oceans. It is understood that Captain SHUFELDT will command the expedition to be fitted out in August, and leave in September.

Method of Cutting Glass Tubes.—M. DUCOMET, of Paris, has invented a simple and ingenious method of cutting glass tubes. It consists in the employment of a metallic rod with a diamond set in one end, the rod being covered with plaited cotton and supplied with a movable gauge to regulate the length. To use this instrument all that is necessary is to introduce the end carrying the diamond into the tube to be cut, and then turn it round so as to make a scratch with the diamond around the interior of the tube at the point where it is desired to separate the latter. The correct position of the cut can be insured by the use of the guard, which can be fixed at any desired point on the rod by a screw. After the cut or scratch has been made in the manner described, the tube can be at once divided at the desired point by merely bending it, or, if the piece to be cut off is very short, all that is necessary is to hold the tube above the flame of a lamp or candle, when it will at once divide at the point where the diamond cut was made. M. DUCOMET states that it is absolutely necessary that the rod should be covered with cotton or similar soft material, or that otherwise tubes cut in this way—gauge-tubes for instance—will subsequently break when in use. The instrument is particularly adapted to cutting gauge-tubes.

MARKET REVIEW.

The Coal Trade.

NEW YORK, September 2, 1870.

WHOLESALE.—Trade has slackened off a little during the past few days, buyers seemingly having lost confidence in prices. The stocks of coal generally in the hands of retailers are not large, and the coal that has come forward has been rapidly taken. We find no large stocks of coal stored here or at the East. Why there should be any hesitancy on the part of buyers, it is difficult for us to comprehend. The surplus in shipments this year over the last is only some 1,700,000 tons, most of which has been consumed. The country should use all of 2,500,000 tons more this year than last. This 800,000 tons has to be supplied between now and the latter part of November, and we consider that the various coal producing districts will have all they can do to make up this deficiency. There is also a much better demand for coal this year than last. Our manufacturing establishments are generally running on better time, and more of them are in operation. The general monetary state of the country is better, too; and best of all, coal is at a figure that none need go unprovided. September is a good month to lay in supplies. Coal rarely can be purchased at better figures during the year. The prices noted for September in this week's JOURNAL are more than fair; in fact, we very much fear they cannot be maintained. They offer no profit to the miner, and in many cases they suffer an actual loss. In Schuylkill county, we hear of coal being sold at Pottsville as low as $2 50, $2 75 @ $2 85. These are not paying rates. Our readers should look out. Take your coal when you can get it at fair prices, lest something transpires to advance the price. At present, nothing appears to give us any alarm, but something may turn up at any moment. If prices were a dollar or two higher than they are—as was the case a year ago—we would not counsel such action, but when it is impossible for coal to recede 25 cents per ton, while there is some probability of an increase as the season advances, we think that dealers can lose nothing by taking the risk, and sending in their orders now. There is another advantage to be gained at this season. Vessels are in good supply, and freights are moderately low. Later in the year such may not be the case. Generally, transportation becomes blocked by a sudden change in the weather, or from the fact that all wish to be supplied at one time. Dealers should bear in mind these facts. There has been an advance in tolls by the various carrying companies during the past two weeks; that these may be augmented at any time, is probable. Transportation companies must make dividends to stockholders, and they generally try to secure their profits at the latter end of the season, when everybody must have coal. Taking these and many other facts in consideration, we say, "Now is the time to buy coal."

The various grades of coal are coming to market in very good condition. Messrs. LEWIS AUDENRIED & COMPANY are offering their Diamond vein and Locust Dale, both superior Red Ash coals, also Broad Mountain and Locust Mountain White Ash coals at from $5 25 to 6 50. G. B. LINDERMAN & COMPANY quote Sugar Loaf Lehigh at $4 75 to 5 75, at Elizabethport; COXE BROTHERS & COMPANY quote Cross Creek Lehigh coal, and SAMUEL BONNELL, JR. Sugar Creek Lehigh and Wyoming coals at the same figures. Messrs. WHITE, FOWLER & SNOW have the exclusive control of the famous Room Run Lehigh coal, well known through the country, which they offer as low as any other first-class coals, $4 75 to 5 75.

The Wilkesbarre Coal and Iron Company are making extensive preparations to supply their fine grade of family coal fully up to the demand. We have heretofore called attention to the care taken in the preparation of the various sizes of coal sold by this company, and we understood that no effort will be spared to retain the good reputation of the company.

The Scranton sale of 80,000 tons which took place on Wednesday last, was well attended but the coal was mostly taken in small lots. The following are the highest and lowest prices obtained at the sale, with a comparison of the rates, for all sizes, at the sale of last month:

1870.			July 28.
12,000	Tons	Lump	$4 20 @ 4 37½
10,000	"	Steamboat	4 45 @ 4 45
16,000	"	Grate	4 87½ @ 4 95
10,000	"	Egg	5 00 @ 5 02½
20,000	"	Stove	5 50 @ 5 62½
12,000	"	Chestnut	4 40 @ 4 50
80,000			

1870			Aug. 31.
11,000	Tons	Lump	$4 10 @ 4 27½
10,000	"	Steamer	4 40 @ 4 45
16,000	"	Broken	4 75 @ 4 85
8,000	"	Egg	5 05 @ 5 10
25,000	"	Stove	5 40 @ 5 50
10,000	"	Chestnut	4 10 @ 4 25
80,000			

The above sale shows an average decline of about nine cents per ton—which amounts to little or nothing, and we don't consider it as showing the tendency of the market at all, but rather the caprice of a few small buyers. The new prices fixed by the Lehigh Board and the principal companies, do not show any advance over last month's rates. The enforcement of "The New Ventilation Bill" is reported of several collieries in the various districts. This bill calls for two openings (instead of one, as many of the mines now have), as a means of exit in case of accident. It also calls for a reduction in the number of men employed to twenty, in case there is only one opening. As it takes some five or six weeks to make a second opening, the shipments from many of our large producing collieries may fall off for some time to come, for the reasons above stated.

The tolls on the Reading Railroad for coals destined for east of New Brunswick and south of Cape Henry, were advanced yesterday equal to 80 cents a ton, instead of 50 in September, and 30 in October, as was supposed might be the policy of the company. The whole advance has been made at a single leap. To all other points the advance has been but 40 cents a ton.

BITUMINOUS COALS.—Foreign coals are quiet at our quotations. Gas coals are more active. Despard Gas Coal is in good demand from our leading gas companies, and brings from $7 to $7 25 per ton.

RETAIL.—Trade has been very good during the past week. Families are returning to their winter homes and looking out for their winter supply of coal. We quote Lehigh from $6 50 to $7 50, delivered. Company coals from $5 50 to $6 50, delivered.

Anthracite Coal Trade for 1869 and 1870.

The following table exhibits the quantity of Anthracite Coal passing over the following routes of transportation for the week ending August 27, 1870, compared with week ending August 28, 1869.

COMPANIES.	1869. WEEK.	1869. TOTAL.	1870. WEEK.	1870. TOTAL.
*Phila. & Reading R.R.	108,591	2,292,348	116,167	1,640,978
Schuylkill Canal	8,693	446,294	27,507	135,836
Lehigh Valley R. R.	49,134	1,478,739	64,524	2,098,738
Lehigh & Sus. R. R.	20,001	494,218	52,105	638,740
Lehigh Canal	27,987	445,416	27,656	463,854
Scranton North	1,239	209,512	23,554	406,083
" South	4,442	626,615	30,635	1,153,040
Penn. Coal Co., rail	23,245	627,739	23,471	742,649
" " " canal	597	11,312	1,206	13,380
Del. & Hud. Canal Co.	13,277	660,305	47,798	1,031,572
" " R. R.	97	102,866	8,553	301,500
" " south		51,174	8,360	298,760
Shamokin	15,162	259,801	16,718	280,159
Trevorton	2,091	16,665	3,131	53,281
Lykens Valley Coal Co.	2,132	45,352	5,822	82,395
Wyoming South		145,848		179,126
Wyoming North	5,022	18,249		
P. N. Y. C. & R. R. Co.			6,296	196,658
Williamstown, Col'y	6,116	115,518	6,864	192,066
Short Mountain	2,675	67,896		
Total	290,501	8,117,207	440,339	9,888,453
1869			290,501	8,117,209
Increase week and year			149,838	1,771,246

* Less coal transported for Company's use and Bituminous coal.

Bituminous Coal Trade, 1869 and 1870.

The following table exhibits the quantity of Bituminous Coal passing over the following routes of Transportation for the week ending Aug. 27, 1870, compared with week ending August 28, 1869.

COMPANIES.	1869. Week.	1869. Year.	1870. Week.	1870. Year.
B. & O. R. R.	25,431	706,843	18,047	605,821
C. & O. Canal	17,302	420,673	18,639	398,801
H. & B. T. R. R.	6,343	230,565	....	179,848
Harrisburg & D.	12,137	255	13,474	508,414
L. V. R. R.	....	....	....	9,380
P. & N.Y. C. & R. Co.	....	....	6,130	163,266
	61,213	1,358,633	56,290	1,865,530
	56,290			1,358,633
Decrease	4,923		Increase	507,897

Schuylkill Coal Trade.

Report of Coal transported via the P. and R. R. for the week ending Aug. 25, 1870—less coal carried for Company's use, and Bituminous Coal:

For week	116,166 15
Previously this year	1,524,811 15
Total	1,640,978 10
Same time last year	2,292,348 00
Decrease	651,369 10
Amount sent same week 1869	109,591 00

Report of coal transported over the Schuylkill Canal for the week ending Thursday, August 25, 1870.

	Tons. Cwt.
From Port Carbon	— —
" Pottsville	— —
" Schuylkill Haven	26,313 00
" Port Clinton	1,194 00
Total for week	27,507 00
Previously this year	108,328 10
Total	135,835 10
To same time last year	446,293 14

Amount of coal transported on the Philadelphia and Reading Railroad for the week ending Thursday, August 25, 1870:

From St. Clair	39,154 00
" Port Carbon	8,771 13
" Pottsville	6,073 04
" Schuylkill Haven	38,094 08
" Auburn	6,105 05
" Norristown	— —
" Port Clinton	17,723 03
" Allentown and Alburtis	245 02
" Harrisburgh and Dauphin	13,474 09
Total paying freight	129,641 04
Coal for Company's use	2,367 15
Total for week	132,008 19
Previously this year	2,046,514 17
Total	2,178,523 07
To same time last year	2,641,175 07

Report of Coal Transported by the Lehigh Coal and Nav. Co.'s Railroads and Canals,

Week ending August 27, 1870—Compared with same time last year.

WHERE SHIPPED FROM	WEEK, 1870. tons ct	WEEK, 1869. tons ct	YEAR 1870, tons cwt.	YEAR, 1869. tons cwt.
Wyoming Region	28120 07	26174 16	779831 18	484909 17
Upper Lehigh Region	3619 00	270 11	93629 00	77288 03
Mahanoy Region	191 00	347 05	1165 08	2254 06
Hazleton Region	9836 05	2398 15	186339 02	113927 07
Beaver Meadow Region	4767 09	5538 12	89723 18	71516 17
Mauch Chunk Region	11751 16	14214 02	53338 01	231784 14
Totals	58015 17	48904 01	1204257 07	981681 04
Increase	9111 16		222576 03	
Decrease				
DISTRIBUTION.				
Forwarded East of Mch Chunk by Rail	25105 00	20301 12	638740 10	494218 10
Forwarded East of Mch Chunk by Canal	27658 02	27967 11	403834 10	446456 13
Delivered at and above Mauch Chunk	1200 19	914 18	27693 08	21161 12
Delivered to L. & B. R. R. at PlymouthBridge	4051 16		133988 19	14893 06
L. V. R. R. at Sugar N.				5151 03
Totals	58015 17	48904 01	1204257 07	981681 04
Of the above there was transported on acc'nt of L. C. & N. Co.	13931 04	15356 05	73100 13	233822 06
W.-B. C. & I. Co.	15134 12	10558 18	355334 17	253876 18
Totals	29065 16	5965 03	428735 10	507699 04
Increase	3300 13			
Decrease			88963 14	

Report of Coal Transported over Lehigh Valley Railroad

For the week ending August 27, 1870, and previously this season, compared with same time last year:

WHERE SHIPPED FROM.	WEEK. Tons. Cwt.	PREV'LY. Tons. Cwt.	TOTAL. Tons. Cwt.
Total Wyoming	9,661 12	426,446 16	436,108 08
" Hazleton	48,201 17	1,389,670 11	1,437,872 08
" Upper Lehigh	486 12	9,473 03	9,959 15
" Beaver Meadow	19,442 19	501,920 08	521,363 07
" Mahanoy	8,561 10	163,857 17	172,419 07
" Mauch Chunk	32 14	515 00	547 14
Total Anthracite	86,393 04	2,491,883 15	2,578,276 19
Bituminous Coal recv'd from Cata. R. R.			
N. C. R. R.			
E. P. R. R.		9,380 00	9,380 00
P. & N.Y. C. & R.R. Co			
Fall Creek			
Schroeder			
Towanda			
Total by rail and canal	86,393 04	2,501,263 15	2,587,656 19
Same time last year	58,036 00	1,657,206 09	1,715,304 09
Increase		843,997 06	874,354 10
Decrease	28,357 04		
Forwarded East from M'h Chunk by rail	64,523 14	1,994,213 19	2,058,737 13
Same time last year	49,134 18	1,429,604 10	1,478,739 08
Increase	15,388 16	564,609 09	579,998 05
Decrease			

RECAPITULATION.

Forwarded East from M'h Chunk by rail	64,523 14	1,994,213 19	2,058,737 13
To N. C. R. R., at Mount Carmel	385 02	1,273 03	1,658 05
Forwarded North from L. & B. Junction	6,266 10	189,910 10	196,077 00
To L. & S. R. R. at Packerton for rail	212 07	5,399 14	5,612 01
Delivered at M'h Chunk	10 19	835 03	846 02
Delivered on line of road above Mauch Chunk	54 02	7,686 04	7,740 06
Delivered above M. Chunk for use of L. V. R.R.	850 07	37,041 16	37,892 03
To L. & S. R.R., at P'n Hav., for railroad	9,131 14	170,608 02	179,739 16
Do. for canal	4,958 09	84,915 04	89,873 13
At M.Chunk for canal	86,393 04	2,491,883 15	2,578,276 19
Total Anthracite		9,380 00	9,380 00
Bituminous Coal	86,393 04	2,501,263 15	2,587,656 19
Total all kinds			

Delaware and Hudson Canal Company.

Coal mined and forwarded by the Delaware and Hudson Canal Company, for week ending Saturday, Aug. 27, 1870.

	WEEK.	SEASON.
North	40,996 12	1,474,807 12
South	8,360 03	298,760 00
Total	49,356 15	1,773,567 12
Corresponding time in 1869.		
North	2,564 09	725,441 05
South		49,457 04
Total	2,564 09	774,898 09
Increase North	38,432 03	Increase 749,366 07
Increase South	8,360 03	Increase 249,302 16
Total Increase	46,792 06	Increase 998,669 03

Harrisburgh and Dauphin Coal Trade.

The following is the amount of Bituminous Coal transported via the P. and R. R. for the week ending August 25, 1870:

	Tons.
For week	13,474 09
Previously this year	494,940 04
Total	508,414 13
Same week last year	12,137 14

Penn. and N. Y. Canal and Railroad Co.

REPORT of Coal Transported via the Pennsylvania and New York Canal and Railroad Company, for week ending August 27, 1870:

	WEEK.	PREVIOUSLY.	TOTAL.
Anthracite	6,286 10	190,391 07	196,677 17
Bituminous	6,130 00	157,136 00	163,266 00
Total, Ant. and Bit	12,396 10	347,527 09	359,923 19

Shipments of Cumberland Coal

for the week ending Saturday, August 27, and for the year 1870:

SHIPPED BY	B. & O. R. R.	C. & O. CANAL.	TOTAL.
Cooke M.	.....	.....	.....
Borden	1,583 13	2,166 05	3,704 18
Consolidation	4,041 19	5,698 05	9,740 04
Spruce Hill	324 15	.....	324 15
Midlothian	775 07	1,093 04	1,868 11
H. and Baltimore	....	400 04	400 04
do Va M	269 16	.....	269 16
V C & I Co	1,139 19	.....	1,139 19
G. C. C. and I.	1,472 01	.....	1,472 01
Maryland	516 05	4,898 13	5,414 18
American	4,382 06	1,223 08	5,605 14
Atlantic	307 14	.....	307 14
Piedmont	1,330 00	.....	1,330 00
Swanton	1,009 17	.....	1,009 17
Barton	920 00	.....	920 00
Potomac	885 00	.....	885 00
Franklin	2,135 16	.....	2,135 16
Big Vein	1,576 13	.....	1,576 13
Total week	22,626 01	15,479 19	38 166 09
Previous	597,225 01	375,579 07	972,804 08
Total year	619,851 02	391,059 06	1,010,910 08

Statement of coal transported over the Cumberland and Pennsylvania Railroad during the week ending Saturday, Aug. 27, and during the year 1870, compared with the corresponding period of 1869:

WEEK.

YEAR.	C. & O. CANAL. Tons. Cwt.	B. & O. R. R. Tons. Cwt.	TOTAL. Tons. Cwt.
1870	16,377 11	15,148 10	31,526 01
1869	15,561 00	22,126 15	37,687 15
Increase	816 11		
Decrease		6,978 05	6,161 14

YEAR.

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1870	337,420 00	538,439 13	875,859 13
1869	374,639 19	637,266 08	1,011,906 07
Increase			
Decrease	37,219 19	98,826 15	136,046 14

Statement of coal transported over the Eckhart Branch Railroad, during the week ending Saturday, Aug. 27, 1870, and during the year 1870, compared with the corresponding period of 1869:

WEEK.

YEAR.	C. & O. CANAL. Tons. Cwt.	B. & O. R. R. Tons. Cwt.	TOTAL Tons. Cwt.
1870	2,261 06	2,908 18	5,170 04
1869	1,741 12	3,304 17	5,046 09
Increase	519 14		
Decrease		395 19	123 15

YEAR.

YEAR.	C. & O. CANAL.	B. & O. R. R.	TOTAL.
1870	61,381 13	67,381 02	128,762 15
1869	46,032 15	69,576 09	115,610 04
Increase	15,847 18		13,152 19
Decrease		2,195 07	

Prices of Coal by the Cargo.

[CORRECTED WEEKLY.]

SCHUYLKILL.	AT NEW YORK, September 2. R. A.	W. A.	AT PHILADELPHIA, September 1. R. A.	W. A.
Lump	$— —	$5 00	4 75	4 80
Steamer	— —	5 00	4 25	4 60
Broken	— —	5 50	4 50	4 70 to — —
Egg	5 75 to 6 50	5 50 to 6 00	4 50	4 70 to — —
Stove	5 75 to 6 50	5 50 6 00	4 00	— — to — —
Chestnut	4 50 to 5 60	6 25 6 75	—	— — to — —
Pea	— —	— —	— —	— —
LEHIGH.				
Lump, (along side)cpd	6 10	— —	— —	— —
Broken	5 85	— —	— —	— —
Egg	5 85	— —	— —	— —
Stove	6 10	— —	— —	— —
Chestnut	5 25	— —	— —	— —
Pea	— —	— —	— —	— —
SPECIAL COALS.*	R. A.			
Diamond Vein	6 50		— —	— —
New England	"		— —	— —
Locust Dale	W. A.	6 25	— —	— —
Honey Brook, Le'h	W. A.	4 75 to 5 75	— —	— —
Spring Mountain "	"	4 75 to 5 75	— —	— —
Sugar Creek	"	4 75 to 5 75	— —	— —
Sugar Loaf	"	4 75 to 5 75	— —	— —
Old Comp'y's	"	4 75 to 5 75	— —	— —
Cross Creek	"	4 75 to 5 75	— —	— —
Enterprise	"	"	— —	— —
Girardville	"	"	— —	4 75
McMichael	"	"	— —	4 75
Shamokin	"	"	5 50	5 75 — —
Lykens Valley	"	"	— —	5 25 — —
Broad Top	"	"	5 50	— —
Hill & Harris	"	"	4 75	— —
Henry Clay	"	"	— —	5 00 — —
Powelton	"	"	5 50	5 00 — —

[*Dealers in these coals may be found in our advertising columns.]

Prices for Coal at Mauch Chunk.

	F. L.	Bro.	Gra.	Eg.	Sto.	Ches.
Lehigh	$3 00	$3 75	$3 75	$3 75	$4 00	$3 00
Wilkesbarre	3 00	3 75	3 75	3 75	4 00	3 00

For freight to Elizabethport and to New York see "Freights."

BITUMINOUS COALS.

Kittaning Coal Co.'s	Phœnix Vein	f.o.b. at Phila.	$5 00
"	Lemon	" "	4 75
Cumberland Vein Coal			5 00
Cumberland C. & I. Co.'s on board		N. Y.	7 00
Maryland Coal Co.		"	7 00
Consolidated Coal Co.'s		"	7 00

Company Coals.

	L.	Str.	Gra.	Eg.	Sto.	Ches.
Scranton at E. Port	4 60	4 75	4 25	5 25	5 75	4 75
Pittston at Newburgh	5 00	5 00	5 20	5 30	5 50	4 70
Lackawana at Rondout	4 50	4 60	4 90	5 00	5 50	4 50
Wilk'b're at Hoboken	4 75	4 75	5 25	5 25	5 75	4 75
Old Co. Lehigh at Pt. Johnston	6 25	6 00	6 00	6 00	6 25	5 25
Lehigh at E. Port	5 75	5 50	5 50	5 50	5 75	4 75

For freights to different points, see "Freights."

Prices at Baltimore—September, 1870.

Wholesale Prices to Trade.

Wilkesbarre, by cargo or car load	$5 30@5 50
Pittston and Plymouth, do	5 00@5 25
Shamokin Red or White Ash, do	5 50@6 00
Lykens Valley Red Ash, do	5 40@5 50
Zerbe Valley	25 0@— —
By retail, all kinds per ton of 2240 lbs.	7 00@7 50
Georges Creek & Cumberland f. o. b. at Locust Point for cargoes	4 75@5 00
Fairmont and Clarksburg gas, f. o. b. at L. Point	5 35@5 50

Prices at Georget'n, D.C., & Alexandria, Va.

September, 1870.

George's Creek and Cumberland f. o. b. for shipping $4 55

Prices at Havre de Grace, Md.

Wilkesbarre and other White Ash for cargoes	$— @—
Lykens Valley	— @—
Shamokin Red or White Ash	— @—
Trevorton and Zerba Valley	— @—

Prices of Gas Coals.

September, 1870.

PROVINCIAL.

Corrected weekly by Louis J. Belloni, Jr. 73 Pine st., N.Y.

	Duty, $1 25, gold. Coarse.	Slack.
Block House	$1 75 @ 75	
Glowrie	1 75 @ 75	

Corrected by Bird, Perkins & Job, 86 South street.

	Coarse.	Culm of Coal.
Pictou	$2 25 @1 25	
Sydney	2 25 @ 80	
Lingan	1 75 @ 80	
Little Glace Bay	1 75 @1 00	
Caledonia	1 60 @ 80	

A discount from the prices of the coarse Coal on purchase of 5000 tons and upwards. Duty $1 25 per ton, gold, on the coarse coal. 25 per cent. ad valorem on the Culm of Coal.

AMERICAN.

	Coarse.	Slack
	Currency.	
Fairmount Gas Coal Co. of N. Y.	7 50	@— —
Despard Coal Co	$7 50	@— —
Penn	— —	@— —
Newburg Orrel Gas	— —	@— —
West Fairmount Gas Coal	8 00	@— —

AT PHILADELPHIA.

Powelton $7 80

Prices of Foreign Coals.

September, 1870.

Duty $1 25 per ton.

Corrected weekly by PARMELE BROS., No 32 Pine street, New York.

Liverpool Gas Caking	$ 8 00@— —
" " Cannel	10 00@12 00
" House "	13 50@15 50
" " Orrel	12 00@14 00

Per ton 2,240 lbs., ex-ship.

PRICES FROM YARD.

Liverpool House Orrel, screened	$16 00@17 50
" " Cannel, "	18 00@20 00

Per ton 2,000 lbs. delivered.

Rates of Transportation to Tide Water.

BY RAILROAD.

TO PORT RICHMOND, PHILADELPHIA.

Philadelphia and Reading Railroad, from Port Carbon	$2 00
Less drawback of 80 cents on all Coal shipped east of New Brunswick and south of Cape Henry,	

MAUCH CHUNK TO ELIZABETHPORT.

L. V. Railroad from Mauch Chunk to Easton	$ 84
C. R. R., N. J., Easton to Elizabethport	1 27
Shipping expenses at Elizabethport	25
Warfage	10
Total	$2 46

MAUCH CHUNK TO PORT JOHNSON.

L. V. R. R., or L. & S. R. R. from M. C. to Easton	$ 84
C. R. R., of N. J., Easton to Pt. Johnson	1 34
Shipping expenses	25
Warfage	10
Total	$2 53

TO HOBOKEN.

L. V. R. R., Mauch Chunk to Easton	$ 84
Morris & Essex R. R. Easton to Hoboken	1 34
Shipping expenses	25
Warfage	10
Total	$2 53

TO SOUTH AMBOY.

L. V. R. R.	84
B. & D. R. R.	1 14
Cam. & Am. R. R.	
Shipping Expenses	25
Total	$2 23

PENN HAVEN TO ELIZABETHPORT.

L. V. RR. Penn Haven to Easton	84
C. RR. of N. J. Easton to Elizabethport	1 27
Shipping expenses	25
Wharfage	10
Total	$2 46

BY CANAL.

Via Schuylkill Canal.

TO PHILADELPHIA.

From Schuylkill Haven	$1 07
" Port Carbon	1 10
" Port Clinton	1 00

TO NEW YORK.

From Schuylkill Haven	$1 70

Via Lehigh Canal.

TO PHILADELPHIA.

Lehigh Canal	$0 70
Freight and towage	1 07
Total	$1 77

TO NEW YORK.	
Lehigh Canal	$ 40
Morris " } Freight } Towing }	1 10
Total	$ 2,50
TO JERSEY CITY.	
Lehigh Canal	$ 40
Morris " " } Freight }	2 00
	2 40
For re-shipment	2 20
Total	$4 60

Via Delaware and Raritan Canal.

TO NEW YORK.	
Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	35
Freight	1,25
Towage	20
Total	$ 2,50
TO NEW BRUNSWICK.	
Lehigh Canal	$ 40
Delaware Division Canal	30
Delaware and Raritan Canal	35
Freight	1,05
Total	$ 2,10

For Re-shipment—30 extra for shipping, and 10 cents. drawback.

Freights.—SEPTEMBER, 1870.

TO EASTERN PORTS.	From Philadel'a.	From E. Port and Port Johnston.	From Newburg.	From Rondout.
Amesbury	$2 70	$2 15	$	$
Bangor	2 80	1 90	1 60	
Bath	2 75	2 00	— —	
Boston	2 70	1 95	2 25	1 90
Bridgeport	1 60	1 00	1 10	1 20
Bristol	2 30	1 40	1 40	
Cambridgeport	2 70	1 40		
Derby	2 00	1 20		
Dighton	2 30	— —	1 45	
East Cambridge	2 90	2 30		
Fall River	2 30	1 40	1 40	
Hackensack	1 75	1 50		
Hartford	2 75	1 35		
Jersey City	1 35 to 1 55	60		
Middletown	2 25	1 25		
Mystic	— —	1 25	1 30	
New Bedford	2 35	1 40		
Newburyport	2 70	2 10		
New Haven	1 70	1 00	1 10	1 20
New London	2 30	1 20	1 25	1 30
Newport	2 30	1 25	1 40	
New York	1 35 to 1 50	1 60	70	
Norwalk	1 80	1 00	1 05	
Norwich	2 30	1 30	1 35	1 40
Pawtucket	2 30	1 50	1 60	
Portland	2 70	1 75		
Portsmouth, N. H.	2 90	2 10		1 85
Providence	2 30	1 40	1 45	1 45
Rockport	2 10	— —		
Saco	2 75	2 10		
Sag Harbor	1 70	1 40	1 30	
Salem	2 70	1 90	2 25	2 35
Stamford	2 00	1 00	1 00	
Stonington	2 00	1 30	1 25	
Taunton	2 30	2 00		
Warren	— —	1 40	1 45	
Washington	1 50			
TO RIVER PORTS.				
Albany		90	- 60	
Catskill		— —	- 50	
Cockaackie		— —	- 50	
Coeyman's		— —	- 75	
Cold Spring		— —	- 35	
Fishkill		— —	- 30	
Haverstraw		50	- 60	
Hudson		— —	- 50	
New York		— —	- 70	
Nyack		50	- 60	
Poughkeepsie		— —	- 35	
Rhinebeck		— —	- 30	
Rondout		— —	—	
Saugerties		— —	- 40	
Sing Sing		— —	- 75	
Stuyvesant		— —	- 55	
Tarrytown		80	- 75	
Troy		90	- 75	
West Point		—	- 35	
Yonkers		40	- 60	

Towing Rates.

TO EASTERN PORTS.

	Per Ton.
To New Haven	$ 40
Bridgeport	40
Southport	40
Westport	40
Norwalk	40
Stamford	40
	Per Boat.
Greenwich	$70 00
Port Chester	80 00
Mamaroneck	70 00
Glen Cove	
New Rochelle	55 00
East Chester	60 00
West Chester	30 00
White Stone	30 00
College Point	25 00
West Farms	25 00
Flushing	30 00
Harlem and Mott Haven	20 00
Port Morris	20 00
Ninety-first street and Astoria	15 00

Boats beyond Port Chester, with less than 200 tons, $80 per Boat.

METALS.

NEW YORK, September 3, 1870.

IRON.—Duty: Bars, 1 to 1¼ cents ℔ lb; Railroad, 70 cents ℔ 100 lbs.; Boiler and Plate, 1½ cents ℔ lb; Sheet, Band, Hoop, and Scroll, 1¼ to 1¾ cents ℔ lb; Pig, 9 ℔ ton; Polished Sheet, 3 cents ℔ lb.

	Store Prices.
Pig, Scotch No. 1, ℔ ton	33 00@36 00
Pig, American, No. 1	33 00@— —
Pig, American, No. 2	31 —@— —
Pig, American, Forge	29 —@30 —
Bar, Refined, English and American	— —@75 00
Bar, Swedes, assorted sizes (gold)	85 00@100 00
	Store Prices, Cash
Bar, Swedes, ord'y sizes, less 5 ℔ ct	— —@110 00
Bar, Refined " "	80 —@ 85 00
Bar, Common " "	75 00@ 80 00
Scroll " "	97 50@130 —
Ovals and half-round " "	100 —@125 —
Band " "	95 —@— —
Horse Shoe " "	95 —@— —
Rods, ¼ to 3-16 inch " "	85 —@120 —
Hoop " "	105 —@150 —
Nail rod, less 5 ℔ ct	— 7 @—7¼
Sheet, Russia, as to Nos. (gold)	— 11¼@—11¾
Sheet, Single, D, and T. Common	— 5 @— 6

Sheet, Galv'd, Nos. 14 to 26 10 and 12c. Nos. 27, 28, and 29, 13@14

Rails, English (gold), ℔ ton	59 00	@60 00
Rails, American, at Works in Pa	70 00	@71 00

STEEL.—Duty: Bars and ingots, valued at 7 cents ℔ lb or under, 2½ cents; over 7 cents and not above 11, 3 cents ℔ lb; over 11 cents, 2½ cents ℔ lb, and 10 ℔ cent ad val. (8t prices.)

English Cast (2d and 1st quality) ℔ lb	— 15	@— 18
English Spring (2d and 1st quality)	— 7	@— 10
English Blister (2d and 1st quality)	— 10	@— 17
English Machinery	— 11½	@— 14
English German (2d and 1st quality)	— 13	@— 15
American Blister "Black Diamond"	— —	@— 12
American, Cast, Tool do.	— —	@— 18
American, Spring, do.	— 9	@— 11
American Machinery, do.	— —	@— 12
American German, do.	— 9	@— 12

COPPER.—Duty: Pig, Bar, and Ingot, 5; old Copper 20 cents ℔ lb; Manufactured, 45 per cent. ad val.

	All Cash.
Copper, New Sheathing, ℔ lb	— @— 30
Copper Bolts	— @— 30
Copper Braziers, 16oz. and over	— @— 30
Copper Nails	35 @— 36
Copper, Old Sheathing, &c., clean	— @— 17
Copper, Chili Pig	— @— —
Copper, American Ingot	20¾@— 21¼
Yellow Metal, New Sheating	— @— 22
Yellow Metal Bolts	24 @— —
Yellow Metal Nails	— @— 22

LEAD.—Duty: Pig, $2 ℔ 100 lbs.; old Lead, 1½ cents ℔ lb; Pipe and Sheet, 2½ cents ℔ lb.

Galena, ℔ 100 lbs	$—	@— —
Spanish (gold)	6 32½	@6 45
German, do.	6 37½	@6 45
English, do.	6 37½	@6 62½
Bar (net)	— —	@8 50
Pipe and Sheet (less 10 per cent)	— —	@9 56

TIN.—Duty: Pig, Bars, and Blocks, 15 ℔ cent. ad val.; Plate and Sheets and Terne Plates, 25 ℔ cent. ad val.

	Gold ℔ lb.
Banca	37 @37¼
Straits	36 @36½
English	32¼@32½

PLATES.

Fair to Good Brands.	Gold.	Currency.
I. C. Charcoal, ℔ box	$8 75 @9 —	$10 50 @11 —
I. C. Coke	7 50 @8 —	9 25 @ 9 75
Coke Terne	6 00 @6 75	7 25 @ 8 00
Charcoal Terne	7 75 @8 —	9 50 @ 9 75

SPELTER.—Duty: In Pigs, Bars, and Plates, $1 50 ℔ 100 lb

	Gold.
Plates, Foreign ℔ 100 lbs.	$6 37½@ 6 62½
Plates, Domestic ℔ lb.	08½@— 11½

REMARKS:

IRON.—Scotch Pig is in ample supply, but the demand for the moment is quite light and the market dull; we only notice 100 tons Eglinton and 50 do. Glengarnock on private terms—the latter held at $33 50, ex ship; the whole range for lots from store is $33 @ $36, according to quality. American is equally as dull as Scotch, the inquiry being insignificant, and holders disposed to realize; 50 tons No. 1 Allentown brought $33, and this is a fair quotation for No. 1; No. 2, $31; and Forge $29 @ $30. Of other kinds we notice sales of 600 tons No. 1 Wrought Scrap, ex ship and store, and 800 do. in Boston, on private terms; 95 do. old T, and 200 do. old Double-headed Rails, $39, gold; and 300 do. of the latter, to arrive, on terms we did not learn. Refined Bar from store is very dull at our quotations. We have heard of no movement in Russia Sheet.

LEAD.—Pig remains quiet and unchanged; 100 tons common Spanish sold at $6 35, gold, and 150 do. on private terms. The manufacturers have come to an agreement, and prices haye been considerably advanced. The price of Bar has been fixed at 8½ cents net, and Pipe and Sheet at 9½, less ten per cent. to the Trade. Block Tin Pipe 56, and Tin Lined 18 cents, both net cash.

COPPER.—New Sheathing and Yellow Metal remain steady at 32 and 22 cents. The market for Ingot is quiet, but steady and firm; sales 75,000 lb. Detroit at 21¼ cents; 195,000 lb. Detroit and Lake, 20¾ @ 21¼; and 150,000 lb. Baltimore, 20¾ @ 21, the latter price for small lots.

TIN.—The market for Pig has been quite irregular and unsettled, with some sales of Straits as low as 35 cents, but there was more firmness manifested yesterday, and at the close this description was held at 35½ @ 36; Banca nominally 37, and English 32½ @ 33, gold; the sales are 450 pigs Straits at 35 @ 35¾ cents; and 26 tons English, part to arrive, 32¼ @ 32¾, all gold; 500 pigs Straits changed hands, but the transaction was not a sale. The last English quotation we heard of was £128 10s. for Straits. A further parcel of 1,500 bxs. I. C. Coke Tin Plates, part to arrive, was sold on private terms; there is a fair jobbing demand for Plates generally, at about our quotations.

SPELTER—Is quiet and unchanged; 20 tons Silesian sold at 6½ cents, gold.

STEEL.—There is a moderate demand for the different descriptions, at our quoted store prices.

ZINC.—We notice a sale of 100 casks Mosselmann Sheet, from store, at 9½ cents, less ten per cent., gold. Am. Oxide, 6½ @ 7; French do., 10¼ @ 10½; Sheet do., 10 @ 10½.

MANGANESE—4 @ 4½ cents.

Mining Stocks.

NEW YORK, Aug. 31, 1870.

Mining stocks are dull and without noteworthy change; 500 La Crosse sold at 10 cents—the same as quoted in our list. Below is the Stock Exchange quotations.

	Bid.	Asked.
Bates and Baxter	15	—
Benton Gold	5	10
Black Hawk Gold	20	40
Central Gold	21	23
Consolidated Gregory	70	—
Grass Valley	25	31
Gunnell Gold	15	—
La Crosse Gold	10	12
Liberty	02	—
Quartz Hill	23	—
Symond's Forks	—	75
Smith & Parmelee Gold	50	—

Petroleum stocks are firmer, and show an advance on our last quotations, with but one or two exceptions. We hear of but few sales. Below is the report of the Stock Board:

	Bid.	Asked.
Bennehoff	30	40
Bergen Coal and Oil	40	60
Buchanan Farm	45	—
Central	50	60
Home Petroleum	1 25	1 75
N. Y. and Alleghany	1 00	—
Northern Light	—	—
Pithole Creek	1 00	1 40
Phillips	15	25
Rathboone	—	40
Rynd Farm	27	30
Second National	—	75
United Petroleum Farms	15	20
United States	—	80

San Francisco Stock Market.

We have not much change to note in San Francisco mining stocks, with an exception of a decided advance in Gould & Curry, it being quoted at $110. All other stocks on the list are firmer, but not materially altered. Below is the report per telegraph, dated San Francisco, Aug. 30:

Savage	40	Gould & Curry	110 00
Yellow Jacket	30	Belcher	No sales.
Kentucky	30	Imperial	26½
Chollar Potosi	45½	Amador	218 00

The Slate Trade.

NEW YORK, Sept. 2, 1870.

Prices for roofing slate in this city continue unchanged since our last report. Business is dull. In another column we print some notes from our correspondent now visiting in the slate districts of Vermont. We expect soon to begin the publication of tables giving the weekly shipments of slate from the various quarries, which new feature we have no doubt the trade will appreciate and commend. These tables will be invaluable as a guide in all matters relating to the supply of slate.

The Poultney, Vt., *Bulletin*, of Aug. 27, thus comments on our plans:

"The Slate Trade in the United States is of comparatively recent growth. Thirty years have scarcely elapsed since the first roofing slates were taken from our hills. It is even a shorter time since the working of slate quarries became a branch of business in this country. The future of the trade is promising, even though the present appearance may be discouraging. We are a building people, and must be for many years to come. As we advance the necessity of permanent roofing becomes more apparent. People are no longer willing to cover valuable buildings with shingles; slate only will do. When the present depressed state of business has passed, the slate interest will doubtless step forward and take the rank to which it is entitled by its importance. *One of the great needs of the trade seems to be a reliable organ in New York which shall look after the general interests of the trade, publish returns of the amount of slate sent to market, and give information in regard to the opening of new quarries and the prospects and productions of older ones.* We are pleased to learn that the *Engineering and Mining Journal* of New York is attempting to meet this demand for a slate organ. It has begun publishing returns of the amount of slate shipped from various shipping points, wherever it can obtain correspondents. It has quotations weekly corrected, and is making an effort to make itself valuable to slate men. Its columns are open to communications upon subjects relative to slate working, and the trade in general. The general scope of the paper embraces all Engineering and Mining subjects, articles upon subjects which would be very valuable to our slate and marble men. It is published by Messrs. WESTERN & Co., 37 Park Row, New York city. Subscription, $4 per year. Messrs. WESTERN & Co. have a reporter here now, who is making arrangements to publish weekly the amount of slate shipped by each quarry or company in this vicinity. The beginning will of course be small; there is no reason why it should not in the future assume a first-class importance. We hope our friends will subscribe and keep the paper well supplied with all the slate news in this vicinity."

Prices of Slate in New York.

[Corrected weekly.]

(A "square" represents 100 superficial feet.)

PRICES OF ROOFING SLATE.

Vermont purple, 1st quality, per square	..	$9 00@10 00
" green, 1st " "	..	9 00@10 00
" red, 1st " "	..	15 00@16 00
" variegated, "	..	8 00@ 9 00
Pa. b'k and d'k blue, 1st qual., "	..	7 00@ 8 00

SHIPMENTS OF SLATE OVER THE LEHIGH VALLEY, AND LEHIGH AND SUSQUEHANNA R. R., AND THE LEHIGH CANAL:

For the week ending August 27, 1870.

LEHIGH VALLEY R. R.

ROOFING SLATE.

Jones & Williams	70 squares.
Locke Slate Co	455 "
Hope " "	— "
Lehigh Slate Co	105 "
Henry & Bro	70 "
Girard Slate Co	35 "
D. Williams & Co	— "
J. Anthony	35 "
D. Thomas	105 "
Saylor & Morgan	35 "
Keystone Slate Co	— "
Americrn	35 "
Eagle Slate Co	35 "
Total	980 "

SCHOOL SLATES.

A. W. Leach	109 cases.
D. Williams	160 "
Lehigh Slate Co	6 "
Total	275 "

BLACK BOARDS.

Lehigh Slate Co	8 cases.
Total	8 "

LEHIGH CANAL.

ROOFING SLATE.

Heimbach Slate Co	690 squares.

LEHIGH AND SUSQUEHANNA R. R.

ROOFING SLATE.

Eagle Slate Co	50 squares.
T. J. Thomas	35 "
Hope Slate Co	20 "
Thomas W. Parry	70 "
F. A. Weston	35 "
Pennryhn Slate Co	40 "
Total	250 "

SCHOOL SLATE.

A. W. Lerch	161 cases.

[FROM OUR SPECIAL CORRESPONDENT.]

Vermont Slate and Marble Interests.

WE lay before our readers the following notes from our correspondent in this important section of New England, believing that the interests there represented are really of importance to the country, and that the notes will prove interesting and instructive to many:

FAIR HAVEN

is a small town, situated on the Rensselaer and Saratoga railroad, about eighteen miles from Rutland. The outlet of Lake Bomoseen flows through it, and gives one of the finest water-powers in the State. The first establishment on the stream is the Darcy Nail and Iron Works. On account of business difficulties these works are now idle. Mr. DARCY'S recent death left them in the hands of the administrator, and we understand they will not be started until the estate is settled. The works are admirably situated, being close to the railroad and convenient to the village. These works were run night and day previous to Mr. DARCY'S death, and formed a very important part of the manufacturing interest of the village.

Messrs. JOSEPH ADAMS & SON own a large marble mill here. The marble is all brought from West Rutland or Sutherland Falls, which are the chief marble centres of this region. The mill is running on full time. The weekly shipment of sawed marble from the mill amounts to about fifty tons per week. We believe they are running with about forty or fifty hands; the exact number we could not learn.

The Allen Kerosene Oil Safe Company have their manufactory and office here. These safes are well known in almost every part of the United States. They are what the name indicates, *safes* for holding kerosene oil. They ship from three to five safes per day. These safes prevent leakage entirely, and also evaporation. Even gasoline may be safely stored in them, as they are so tight that no vapor can escape to form an explosive compound. The trade has grown so rapidly that it was found necessary to increase the size of the works several times.

The Fair Haven Marble and Marbleizing Slate Works is the largest concern in the place. The business was begun as a private concern, which was continued till last year, when the mill was burned down, and shortly after a stock company was formed under the present name. All kinds of slate and marbleized slate are turned out.

The Union Slate Company are turning out mantle and billiard stock. The company is simply a business copartnership. The company informed your correspondent that they were making a monthly shipment of 12,000 feet of manufactured stock per week. Mr. VAIL has now about thirty-five men at work in the quarry.

Owing to the fight going on among the producers of billiard beds, the price is much below the actual cost of manufacture. Effort is now being made to arrange a schedule of prices and its seems as though the attempt would be successful and a fair rate established.

Slate here, as near as we can ascertain, is quoted as follows: Variegated, $4 00@4 25, Unfading Green, $5 00@5 25; No. 1 Purple, $5 00@5 75.

S. N. PECK has about twenty men at work, and ships seventy-five or one hundred mantles per month. He has a part of the Union Slate mills at this place.

HYDEVILLE

is a small vilage on the Rensselaer and Saratoga railroad, fourteen miles from Rutland. It is situated at the outlet of Lake Bomoseen. First on the stream is the slate mill of the Forest and Mining and Slate Company, and next it their factory. Mr. A. W. HYDE is President, and PITT W. HYDE the agent of the company. They have sixty men, all told, including those in the mill, factory and the quarry. The marbleizing is done in the factory, which is especially devoted to this. The company sell some rough stock, though the most of it is finished before it goes out. Everything is sold before it leaves the station, as they ship nothing on commission, having no agents abroad. They turn out billiard beds, marble mantles, table-tops, chess tables, blackboards, bracket-shelves; all kinds of plain slate, all sorts of marbleized work. A force of roofing-slate makers is kept constantly at work in the quarry belonging to the company, and sufficient stock is raised to keep both mill and slate-makers going all the time. There are several quarries belonging to the company, but only one, quite near the village, is worked just now. This company own almost all of the mills in the place, and lease them to the parties who run them.

We quote here: Slate—Green, $4 50; Purple, $5 00. These are the very lowest figures. Quite a hopeful feeling exists among these slate men that there will be an improvement in trade before long. S. M. DOBB & SON have a marble mill here, which, on account of the sickness of one of the proprietors, has been closed for a short time. They also have mills at Sutherland Falls and Centre Rutland. Their mill here will be started up within a day or two and be running on full time. Its capacity is about 150,000 feet per year.

E. A. BILLINGS leases a mill of the Forest Mining and Slate Company, and makes all sorts of slate work, but does not finish anything here, i. e., he does no marbleizing, but sells his stock "in the rough." He has enlarged his works from time to time until he now has about $10,000 worth of improved machinery for working slate. His finishing mill is at Troy, New York. Mr. BILLINGS also works a quarry near here, which supplies him with the necessary stock.

SHERMAN, ADAMS, LANGDON & Co., are engaged in the manufacture of marble. The blocks come from West Rutland, and are brought to the mill by railroad, a short side-track taking the cars directly into the mill-yard. They turn out all sorts of sawed marble, slabs, spires, posts, blocks, etc.

During 1868, 1,200 car loads of slate and marble were shipped from this little station.

On Improvements in Inland Navigation.

By Professor S. D. TILLMAN, American Institute, New York.

[Read before the American Association for the Advancement of Science, at the Troy meeting, 1870.]

THE canals and navigable rivers in the territory of the United States form a net-work of transit unrivalled in extent and importance. In the State of New York alone the artificial water-channels of communication have a total length of nearly one thousand miles, of which 893 miles belong to the State. The connections with rivers and small lakes make the whole distance now navigated by New York canal-boats about 1,350 miles. On the twenty canals owned by the State are 565 stone locks, which, if placed in a continuous line, would extend nearly seventeen miles; and the bridges over these canals, if placed end to end, would form a line of equal length. The Erie canal, seventy feet wide and seven feet deep, is carried over several rivers and large streams on stone aqueducts of unequalled magnitude. Some idea may be formed of the business done on the New York canals by the following official statements: From 1859 to 1866 inclusive, 12,850 canal-boats were built and registered, having a total carrying capacity of 1,291,497 tons. During those years the aggregate movement on all the canals amounted to 39,433,625 tons. For the twenty years preceding 1867, the tolls collected amounted to $65,815,411; the yearly average being $3,290,770. After deducting the cost of maintenance, the average annual surplus revenue from the canals is found to exceed $2,319,500. From 1854 to 1864 inclusive, the average freight paid for moving one ton one mile on the canals was nine mills and one-tenth of a mill, while the average freight paid during the same time for moving one ton one mile on both the New York Central and the Erie railroads was 2.41-100 cents, showing that during those years the cost of transportation on railways was nearly three times greater than that on canals.

Boats carrying 210 tons burden are now used on the Erie canal, the enlarged locks being 18 feet wide and 210 feet long between the quoins. These boats are mostly moved by animal power, at a cost of thirty-eight cents each per mile, except on the rivers and lakes where they are taken in tow by steamboats. The average speed of canal-boats of the largest class moved by horses, does not exceed two miles an hour, and as only three horses can be employed with advantage to each boat, it follows that any further increase on the size of canal-boats would involve a corresponding decrease in speed when moved by animal-power.

According to the able report for 1868, by the Hon. VAN R. RICHMOND, New York State Engineer and Surveyor, the resistance to be overcome in moving a loaded canal-boat at a speed of two miles per hour, calculated from DUBUAT'S formula, as modified by D'AUBISSON, is 428 pounds. The force required to develop the standard value of a horse-power at two miles per hour is 187½ lbs.; deducting one-sixth for oblique action, leaves the force exerted in the direction of the boat's motion equal to 156¼. From experiments made in France in towing barges on the Lanquedoc canal, it was found that ordinary horses exerted an average effort of 143½ lbs. each for six consecutive days at a speed of two miles per hour. Consequently an Erie canal-boat, which partakes of the general build of the Languedoc barges, would require three horses to move it at the rate of two miles per hour. The resistance of a vessel varies as the square of its speed, and the power required to move it varies as the cube of its speed. This law seems to have been overlooked by some of those who have attempted to move canal-boats at comparatively high speed by means of steam power. They have recognised the truth of only a part of the proposition, namely: that the resistance varies as the square of the speed, that is to say, if a boat requires eight horses to overcome the resistance at four miles an hour, to double its speed would require four times eight, or thirty-two horses; yet it is evident that this power must be applied while the boat is moving double the distance first made; therefore the number thirty-two must be doubled, which gives sixty-four horses as the measure of the power required to move the boat at the rate of eight miles per hour. This law, however, cannot be strictly true for all forms of vessels, and in navigating canals there are other conditions which modify the result, as, for instance, the wave of displacement which, rising nigh in shallow waters, would seriously impede a vessel, but were its form so improved as to allow the water to commence closing in when only one-third of her length had passed, and were its speed at the same time increased to a certain point, this wave of displacement would be brought into such relative position that it would no longer impede the vessel. However, the carrying capacity of a canal-boat being paramount, its form must not be modified so as to favor increased speed; thus, with this class of vessels the law will still hold good, and to double the velocity the propelling power must be increased eight-fold. If a loaded canal-boat is moved at the rate of two miles an hour with three horses and at the rate of four miles an hour with twenty-four horse-power, the obvious deduction is that it is impracticable to move such boats by horse-haulage at the rate of three miles per hour, and quite as impracticable to move them by steam-power at a speed greater than four miles an hour.

The plan of moving several canal-boats by one steam-tug is objectionable, because the whole moving power is concentrated at one place, and acts upon a very limited quantity of water. The same power, divided into four equal amounts, and acting on four times the quantity of water, would be more effective. Such boats must be liable to delays, and are utterly helpless when detached from the steam-tug. The successful navigation of canals seems to me to depend on the following conditions:

I. Each boat should be automatic—that is to say, self-propelling.

II. The build of the boat should be such as to give it the greatest carrying capacity.

III. To economise space and power, the boiler and engine should be small, and capable of moving the boat when loaded at an average speed of three miles an hour. This rate is about double the present average speed of loaded boats.

IV. The propelling power should act directly against the water, and not against the bottom or sides of the canal.

V. If we turn to nature for lessons in propelling, we observe that the slow-moving fish of our fresh-water streams have broad tails, bounded by a nearly vertical line, while those remarkable for speed have V-shaped tails, the extremities of which are capable of very quick motion. Applying this principle to slow-moving boats, we infer that a quick motion is not so essential as a large area of propelling surface.

VI. The width of the boat and its draft should only limit the quantity of water against which the propelling surface should act.

VII. The boat should be made more obedient to the helm, by enlarging the rudder surfaces, and arranging them so as to act on shallow water more efficiently than by the common method.

The most important of these conditions would be fulfilled by building a boat with four sterns, and placing behind each a propeller; or by giving the boat a scow-shaped stern, and arranging in one line behind it four screw propellers, placed nearly as deep in the water as the bottom of the boat, from which would project iron bars for their protection. The locks being eighteen feet wide, these propeller blades could be nearly four feet six inches in diameter, and whether the boat was light or loaded, these propellers would act on the water under the best possible conditions. Behind each of these propellers should be placed a balanced rudder, which, under these conditions, could be made one-fourth lighter than usual, and the tiller of each should be connected by a movable joint, with one bar extending nearly across the boat, behind which the steersman can guide the boat by only exerting strength sufficient to overcome the friction of the apparatus.

A boat embracing the improvements here suggested has not yet been constructed; but from careful estimates, based on reliable data, I feel warranted in saying that such a boat when loaded could be moved at a speed of three miles an hour, with an expenditure not exceeding that now incurred in towing a similarly-loaded boat at the rate of two miles an hour by means of horses. The saving thus effected would be between one and two millions of dollars per annum on the present business of the canal. A large portion of the carrying trade has been diverted from canals, solely on account of the time consumed in transportation; we may reasonably infer that an acceleration of speed of about fifty per cent. would greatly increase the amount of goods transported by these cheap modes of conveyance, and thus correspondingly increase the revenue which the State derives from its canals.

Caves in the Ozark Mountains.

EXPLORATIONS BY A PARTY FROM ST. LOUIS—A VOYAGE UP A SUBTERRANEAN RIVER—A FOREST OF STALACTITES

THE existence of several remarkable caves in the limestone regions of Missouri has been known to the general public for years. Some of these caverns have been explored, and descriptions written of the subterranean wonders contained therein. One of the most remarkable of these caverns is located on Dr. FISCHER'S land, about six miles and a half south-east of Springfield, Mo., among the Ozark mountains. It was visited last week by a party from this city, and, as little has heretofore been known about its peculiarities, a brief account of its striking features from one of the visitors may not be devoid of interest. The mouth of the cave is at the bottom of a deep ravine, to which a rather steep descent is made for nearly a mile. The cave is on one side of rather an abrupt hill, and from its mouth there issues a clear and cold stream of water, thirty feet in width and four in depth. A boat capable of holding ten persons was in readiness with a guide to ascend the stream; candles were provided, and all necessary preparations made for a voyage into the recesses of the cavern. Thus provided, the ascent against the current was made without much difficulty. The air was cool, the lights were reflected upon the water, and the moisture from the ceiling, which fell in round drops, resembled a shower of pearls. The average height of the roof above the stream is about 1,500 feet. Hundreds of beautiful stalactites were seen hanging from the natural archway, some in clusters. The outside of these stony icicles was encrusted with a substance of a "grayish yellow" hue, but the tips had a viterous appearance, and in some cases were translucent. The tips were hollow, but the tubular form soon became solid where the stalactite was thicker. The length of these pendant cones, caused by the constant accumulation of carbonate of lime gathered from the dripping of the water from the ceiling, was from two to five feet. After proceeding some distance the explorers came upon an arm of the cavern, which branched off into a huge pocket, or chamber, which was twenty yards across and wedge-shaped. The door of this chamber was paved with a multitude of small basins, or cups, formed by a constant dripping of the water upon the floor of the cavern. The drop falling on the soft substance excavated these dish-shaped vessels, the rims of which rose above the general surface of the floor. These natural cups were filled with limpid water, from which the party drank freely. Leaving this singular spot, the voyagers resumed their trip up the underground stream, and after proceeding about 200 yards they came to a small cascade. The fall is caused by a ledge which crosses the cavern stream, and is about three feet higher than the level of the stream below. The roaring of the water of this chute was heard at some distance. The depth of the water below the wall is five feet, and it was estimated that they were half a mile from the point. Above this fall the cavern bifurcated into two branches. The main stream comes down the right fork, but leaving their boat the explorers went some distance up the left fork. The cave narrowed and widened alternately, but at length the roof got so low that they were obliged to proceed in a stooping posture. This mode of progress becoming too fatiguing, further progress was abandoned, and the explorers set out on their return. The boat floated down rapidly, and a halt was only made to observe a beautiful formation, on the right shore, within only 200 yards of the mouth. This was apparently a sheet of alabaster, rolling gracefully over a jutting table of lime, resembling a flowing stream of milk suddenly frozen. The party soon made their exit to open air, much gratified with their exploration. The excavation of this cavern was doubtless caused by the ceaseless action of the stream that still carries on its rasping, denuding work, and consequently is not due, as is the case in many other caverns, to causes which have long ceased to operate.—*St. Louis Republican.*

Cope District, Nevada.

[The following letter from a special correspondent of the ENGINEERING AND MINING JOURNAL, gives a general account of this new and interesting district.]

MOUNTAIN CITY, COPE DISTRICT, Aug. 20, 1870.

TO THE EDITOR: SIR—This city is located on the Owyhee river eighty-five miles north from Elko on the C. P. R. R. It is now a trifle over one year old, has about two hundred buildings, among which are to be found specimens of cloth, adobe, log, frame, and cut stone, and the hammer and saw are to be heard on every side. The population, including Chinese and a few Indians, is not far from 1,000. Cope District, of which Mountain City is the metropolis, is chiefly remarkable as presenting a case of modest merit, something exceedingly rare in these days of shams and false pretences. Her miners, instead of making cayote holes in the hillsides, and then sitting down by them to wait for capital, very sensibly rolled up their sleeves and went to work. Ores were shipped to Reno and other points, at an average expense of $100 a ton for freight and milling, that netted the owners from $50 to $300. The results were expended in further developments, and to-day there are few places in the State that can show a more inviting field for capital or energy and ability than Cope. Late last fall a ten-stamp mill was put up by ATCHINSON, DREW & Co., and has been running steadily over since, principally on Argenta and Crescent ores. Colonel DREW is the superintendent.

Messrs. NORTON & Co. are erecting a thirteen stamp mill, under Mr. TURNER'S superintendence, below the town. They are pushing the work with energy and expect to be ready for crushing by October 1st. I learn that the Argenta company will supply it with ore. Three-fourths of a mile above town, R. H. VANCE is building one of his "Little Giant" mills. The ore is pulverized by the action of rollers on a revolving bed-plate. The mill will have, it is calculated, a capacity for crushing twelve tons daily. The invention has not yet been tested in the field, I believe; but there is one in operation in San Francisco that is said to be a perfect success. This mill is to work on ore from the Mountain City mine on contract. Report says that WALLBRIDGE & Co., of Idaho, are going to put a five-stamp mill on the Monitor mine. So there will be thirty-five at all events, and probably forty stamps in operation this winter—a pretty good showing for a district one year old, and that has paddled its own canoe from the start. The facilities for mining here, are above the average. The climate is mild; snow is never troublesome; wood is abundant within from seven to ten miles; excellent water everywhere; plenty of good pasturage; stock will thrive without feeding the year round; and the mines being located on low foot hills 50 to 200 feet above the valley, are easy of access, and can be advantageously worked in winter as well as summer. My next will contain a brief description of the principal mines and their ores.

F. W. C.

Thomson's Road Steamer and the War Department.

THIS novel and exceedingly useful machine has just been made the subject of a report presented to Parliament by the British War Department, and prepared by Mr. J. ANDERSON, superintendent of machinery, and Mr. JAMES BAILEY, assistant controller—those gentlemen having been requested to report upon the advantages which the engine possesses in a military point of view. The report expresses a highly-favorable opinion of the invention, that opinion being founded upon a close examination, and upon various experiments. The reporters say that up to this time the world has not seen such immense loads drawn along common roads and up such steep inclines, by the expenditure of so small a sum for fuel and labor, and at the same time carried out so easily and smoothly, and with a machine which will, from the elasticity imparted to the construction, enable it to last a long period, and its power of haulage from the soft elastic rubber tyres, enabling the grip taken on the surface of the road to be so extensive—about 240 square inches for each wheel, or, say, 720 inches in all—render its haulage power of the highest value. In their opinion, the future usefulness of the road steamer over the surface of the globe where no railways exist, (which is by far the larger portion,) is incalculable; and they protest against the introduction of tramways on common roads, on account of the great expenditure of capital involved. What is wanted, they say, are good macadamized roads, with small road steamers to run upon them. After what they have witnessed, they say, the road steamer is a perfect success, and when introduced under proper regulations, will be found of incalculable advantage to the public service, and they strongly recommend that one engine and suitable wagons should be ordered for duty at Aldershot, and that a careful code of instructions should be drawn up for its management, in order that its many advantages may be fully developed for army purposes. They consider that, at the end of the year, the eight horse-power engine would show the best balance-sheet; but they, nothwithstanding, think that one of twelve horse-power should now be chosen, so as to be prepared for a march out to any part of the country, in addition to the ordinary camp duty.—*Engineering.*

THE ENGINEERING AND MINING JOURNAL.

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ROSSITER W. RAYMOND, Ph. D., Editor.

PUBLISHERS' ANNOUNCEMENT.

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New Silver Mines.

As will be seen from our mining summary, there is considerable excitement in Colorado over a new district about fifteen miles north-west of Central City, which promises to be highly productive in silver. We are not surprised that these rich discoveries occur in regions that are popularly supposed to have been thoroughly prospected already. The fact is, that for a century to come we shall not finish exploring the metalliferous sections of our country; and a numerous class of our citizens will employ themselves hereafter, as now, in this sort of pioneer work.

It is a pity that our people, who invade with so much enthusiasm the newly discovered territory of a fresh mining district, are so ready to leave it again, at the tidings of something "later and better." In many of these districts, it will be necessary at some future day to begin over again, with more discretion, perseverance and capital. White Pine, for instance, seems just now to be under a cloud, and many persons do not hesitate to call it a "dead camp." But dead camps have come to life again so frequently that it isn't right to bury them on their first collapse. The successive rise and fall of so many districts is proof, not of a rapid exhaustion of our resources, but of the vast extent of the treasures which we are scarcely yet beginning to gather thoroughly and systematically.

Lithofracteur and Dualin.

WE learn that recently experiments have been made at Freiburg, Saxony, with reference to an explosive compound for blasting, which has at least a new name, lithofracteur, though it may not be an entirely new compound. Neither the chemical constituents nor the method of the manufacture of this substance are given, but from the description given of its effects upon the persons employed in making the cartridges as well as upon those who were exposed to the gases generated by its explosion in the mine, we conclude that it is not essentially different in its composition from nitro-glycerine. The experiments alluded to were made in the long-draining adit which has been in construction for several years, and is to be, when finished, the longest tunnel in the world.

In the first experiments that were made, the explosive power of the lithofracteur was over-estimated, and the holes were drilled at too great an angle with the perpendicular, as shown by the fact that some of the holes did not tear at all, and the remainder only partially. Afterwards, however, the holes were set about one-third "stronger" than usual, and very satisfactory results were obtained with only one-fifth as large a charge as is usual for gunpowder. We are told that at one of the working breasts of the tunnel where the lithofracteur was for some time exclusively used, the results were twenty-seven per cent. better than those obtained by the use of powder. The question of the employment of some substance of greater explosive power than ordinary gunpowder is of so great importance, more particularly in the construction of long tunnels, where a saving in time is valuable, that notwithstanding the restrictions which have been put upon the sale and use of nitro-glycerine, it is still largely employed. Lithofracteur is manufactured in this country by CARL DITTMAR at Neponset, near Boston. On the the other hand, dualin, manufactured at the same works, is claimed to be free from many of the objections to which all the modern explosives are open. It has been used in a number of places in Europe and this country, and, so far as we know, with satisfactory results. In the Hoosac Tunnel the contractors express themselves to be highly pleased with the result of their experiments with dualin. They consider it equal in power to nitro-glycerine, which they have been using for some time past, far less dangerous to handle, and free from the bad effects, such as headache and nausea, frequently felt by those who either handle nitro-glycerine, or inhale the gases in the tunnel after the blasts have been fired. Dualin was first introduced in Germany about two years ago, and was used for torpedoes. Among the experiments recorded as having been made, we may mention that barrels of dualin have been thrown from high places upon rocks without exploding; on one occasion a barrel of it was placed on a burning pyre, and the barrel was almost entirely consumed before the dualin was ignited, when it burned without the least detonation. Shells loaded with dualin have been fired from cannon, which further shows its insensibility to concussion. Being a powder, it is unaffected by cold, and does not have to be thawed out, a process which has caused many of the nitro-glycerine explosions. The manner of using dualin does not materially differ from that of ordinary powder. No peculiar fuse is necessary when the hole is tightly tamped: but if loose or water-tamping is practised an exploder is necessary.

Although dualin has been vehemently assailed from many quarters, we can see as yet no sufficient reason for changing our good opinion of its qualities, but wait in common with others practically interested for the decisive verdict of a more extended experience.

New Publications.

FIRST ANNUAL REPORT OF THE GEOLOGICAL SURVEY OF INDIANA, made during the year 1869, by E. T. COX, State Geologist, assisted by Professor FRANK H. BRADLEY, Dr. RUFUS HAMMOND, and Dr. G. M. LEVETTE. Indianapolis, 1869.

THIS volume, a neat octavo of 240 pages, is an important contribution to the practical and economic geology of the West. Besides a good deal of information concerning the structure and stratigraphical relations of the coal-fields of Indiana—a subject about which our knowledge is still quite incomplete—the book contains records of still greater value, such as analyses of coals, iron ores, peat, mineral water, details of metallurgical operations, artesian borings and mines. We say these things are of greater value than theoretical geology or palæontology; but we do not mean to deny the importance of the latter; and we proceed, therefore, to qualify and explain at once our perhaps too sweeping phrase.

The records of geological history in strata and fossils are ancient and permanent. As they have waited, nobody knows how many million years, for man to find and study them, so it will do little harm if they wait a few years longer. There is time enough for that work. But the records of industrial operations, although vitally important for the instruction of the next generation, are ephemeral. After an artesian well is bored and the journal lost (if any was kept), all its revelations as to the valuable coal, oil or brine-bearing strata and their relative depths, are lost to mankind. When a mine has been abandoned, filled up or caved in, and forgotten, the dear-bought experience of its owners speedily dies out of remembrance. The difficulties they met with are unknown; and their successors recommence at some future day the same struggle in the same ignorance.

It is irritating to think that the costly knowledge gained in some such enterprise might have been, but was not, put on record by the geologist who spent his time gathering trilobites or terebratulæ in the neighborhood. By all means go for the trilobites; but bear in mind, gentlemen of geological surveys, that trilobites will keep a million years, while the priceless records of human experience become vague or extinct in a dozen.

Mr. Cox and his assistants have kept in view, we think, quite successfully, this practical aspect of their duty, and their report will consequently prove directly beneficial to the people of Indiana, and to railroad and mining capitalists. With regard to the classification adopted for the coal-measures of the State, we are not inclined to express an opinion. Mr. LESLIE, of Philadelphia, our foremost living authority on such subjects, writes to his journal, the *Railroad and Mining Register*, as follows concerning it:

"We think, however, that Mr. Cox bears a little hard, although not wholly without justice, on the Kentucky geologists. It is true, that a great mistake was committed in the early years of the Kentucky survey, in doubling the height of the coal column. But the mistake was candidly acknowledged afterwards, and rectified. And it looks as if Mr. Cox had gone (theoretically) to the opposite extreme. We do not comprehend precisely how he can deny or doubt the existence of the 'Barren Measures' on the lower Ohio, except by ignoring all the work that has been done in the Appalachian Field. No fact in practical geology has ever been demonstrated more conclusively, or upon a wider basis of observation, than the distinction everywhere exhibited between the lower Coal Measures and the upper Coal Measures, separated by the Barren Measures, a distinction as plainly marked in Eastern Kentucky as in Western Pennsylvania—as prominent at Pottsville as at Pittsburgh. The interval varies from 300 to 700 feet, and cannot be overlooked, for upon it is moulded even the topography, to say nothing of the mining areas, of a region hundreds of miles long and broad. In fact, his section shows a series of Barren Measures, 263 feet thick, between his coals B. & F., and ignoring the thin seams G. & H., we have a Barren region in his section, 327 feet thick, between B. & J., with only one four-foot bed in it, which may well be the equivalent of one of the thin coal seams of the Appalachian Barren Measures. It looks plainly enough as if his coal L., 'the mammoth' seven-foot bed, were the great Pittsburgh bed of the East, or, at all events, one of the four workable beds of the upper Coal Measures. We object, decidedly, also, to any confusion between the Mahoning rock of the lower Coal Measures and the Anvil rock of the upper Coal Measures. Mr. Cox must not correct a local mistake made in the West Kentucky coal field, in such a manner as to overturn all the sound geology which it has taken thirty years to work out satisfactorily over the vast regions east of the Blue Grass country. Nor do we think that he intends to do this; but some expressions in his report will be apt to mislead the younger geologists in that direction, or at least to cause them some embarrassment. And here we would be glad to have somebody undertake an essay on the sand rocks of the Coal Measures; a subject of great importance in the science of identifying coal beds; but which no one has studied, or, at least, written anything upon, as yet. Long experience has convinced us that there is no such thing as 'the conglomerate' or 'the millstone grit,' in the sense of a special and particular continuous rock stratum; but that quite different deposits of sand and gravel have this name given to them in different regions. There was a general deposit of coarse silicious material at the beginning of the coal era, or near the beginning, and other equally general deposits of similar sands and gravels, over equally wide areas, three or four times afterwards, making the Tionesta, Mahoning, Anvil rock sandstones, and one in the Barren Measures, which has received no name. It is very doubtful whether any coal bed A can be selected from among the numerous seams of coal at the beginning of the earliest of these *sandy times*, qualified for use as a starting point, or No. 1, for a general section of universal value."

THE SUNBURST is the title of a new weekly, under the editorial charge of Mr. W. F. MCNAMARA, and intended to be a journal of Irish literature and art. The genius of Irishmen in this direction is certainly well known to the world; nor are the sons of Erin deficient in that warm national sympathy which would lead them to support in preference to all others, journals controlled by their own countrymen and representative of their own eloquence, poetry and artistic power. The *Sunburst* will avoid politics as such, and advocate patriotism and temperance, standing "faithful in its loyalty to the great American republic and its noble institutions." The editor, whom we know, and the list of contributors, among whom there are several of Irish-American celebrity, should be sufficient guaranty that success will be deserved. Whether it will be achieved, is a question depending on the appreciation of the Irish-American public.

The Slate and Marble Interests of Vermont.

THE second of a series of letters, under this heading, appears in this week's issue, from our special correspondent, in the slate and marble districts of Vermont. It is our design to bring this important section of the country more into notice, and to secure regular weekly reports of the amount of slate quarried and shipped to market from the various depots. These reports we hope to make as full as those we now publish of the coal trade, and to this end we earnestly request the coöperation of all those who may be called upon for this information by our correspondent.

Meeting of the American Association.

EDITORIAL CORRESPONDENCE.

[These letters were also published in the N. Y. *Evening Post*, from day to day, during the meeting.]

TROY, August 24–27, 1870.

IV.

MONDAY was spent in an excursion to Saratoga. The Association and the numerous invited guests numbered more than four hundred. Saratoga is undoubtedly more popular than ever. This is due, first of all, to the springs, which, though they have varied a little in their intensity, are still medicinally efficacious, and continue to be visited by thousands of pilgrims in search of health. But the magnitude and unsurpassed excellence of the hotels constitute the great attraction for the fashionable world. Nowhere else are so many people made so comfortable. Union and Congress Hall can dine two thousand each, and lodge from a thousand to fifteen hundred. Then there is in Saratoga that curious mixture of fashion and independence which leaves every one free to follow his own taste or whim, and become the observed or the observer, without question from any source. We found the large ball-room of Congress Hall occupied at high noon by a full orchestra and a crowd of highly-dressed ladies and gentlemen, doing the "German." It was not to celebrate Prussian victories, nor yet to get up an appetite for lunch, but merely to give an opportunity for those who were not satisfied with dancing all night, to dance all day likewise. Then there is the recreation afforded by music and promenading on what the funny man of our party calls the "stoop-end-ous" piazzas or colonnades of the hotels, where, at one time or another, all the world congregates. The excursion party scattered itself through the town, visiting the different points of interest, or hunting up friends among the crowds of guests, and at four o'clock met again to partake of an excellent dinner at Congress Hall. It is a noticeable fact that these scientific people do not bother themselves with after-dinner speech-making. They enliven the progress of the banquet with much social chat and merriment, but when it is over they rise and go. Is this a foretaste of a coming millenium?

Late in the evening, after the return to Troy, there was a brilliant reception at the house of J. M. FRANCIS. The citizens of Troy have, in fact, almost overdone the business of entertainment. Their hospitality has crowded the week of the meeting with excursions and receptions, besides numerous smaller sociable gatherings, so delightful as to interfere somewhat with the more prosaic duties of the section-room. Still, as I have said already, the social enjoyment of these meetings is their most beneficent feature, and the members have proved their appreciation of this fact by the hearty way in which they have entered into the good things of this kind provided by the munificence of Troy.

This (Tuesday) morning indicates "the beginning of the end," in the diminished numbers of the Association; yet the papers read are perhaps more important than ever. The first in section A this morning was a discussion by J. M. SILLIMAN, a recent graduate of the Rensselaer Polytechnic, of the spectroscope reactions of the Bessemer flame, accompanied by diagrams of the flame at different stages. This is one of the most complete investigations of this peculiar and important application of the spectroscope that has ever been made. It reflects great credit upon the author, who, it is rumored, has already been honored with a call to the department of mining and metallurgy in one of our foremost colleges.

Professor BARKER, of Yale, gave a neat, clear system of molecular classification, for the use of instructors in chemistry. This brief paper—for I suppose it is the correct thing to call it a paper, though it was an *extempore* address—was received with unusual applause, bestowed, I think, upon its admirable man

ner, quite as much as its matter. Our scientific men are too apt to overlook the importance of delivery, even in purely scientific assemblies; that is to say, when they are speakers, but they are quick enough to feel it as hearers.

Of perhaps half a dozen papers which have received the distinction of pronounced applause during this meeting, I do not remember one that was not well delivered, while I can recall several of great importance that fell dead, failing altogether of their first effect because they were feebly enunciated. Another point to be remedied is the apparent ignorance of many *savans* as to the proper form which a paper should have, to suit the peculiar conditions afforded by such conventions.

In the same section Mr. CLINTON ROOSEVELT, in a paper entitled, "To whom is due the credit of the most important application of steam as a motive power?" claimed the first conversion of the rectilinear to circular motion for a relative of his own, NICHOLAS J. ROOSEVELT, who, he said, made the invention in question in 1798. The English patent of WILLIAM SIMONTON dates from 1802.

Professor PICKERING, of Boston read a paper on errors in the ordinary graphic method of representing physical laws by curves; and Mr. STIMSON, gas inspector, likewise of Boston, discussed graphically the formulæ of the relation between quantity of light and quantity of gas in illumination by different burners.

In section B there were long geological papers from HITCHCOCK, HALL and PERRY, pending the latter of which the meeting adjourned for dinner. The first paper in the afternoon, Mr. PERRY courteously yielding for the purpose, was a description by R. W. RAYMOND, United States Commissioner of Mining, etc., of certain typical physico-geological phenomena of the Pacific slope. The speaker, to save the time of the meeting, condensed into one rapid talk the substance of his two papers on "The Lava-ducts of Washington Territory," and "The Great Salt Marsh of Silver Peak, Southern Nevada." The former, he said, was a picture from the heart of the great volcanic overflows of the North, and the latter an equally characteristic scene from the region of solfataric and thermal-aqueous metamorphosis in the South. The accumulation of ice in the subterranean lava-ducts, the disappearance in them of streams, ("lost rivers") and various other features were briefly alluded to. The speaker ascribed the alkaline deposits of the Nevada basin to the decomposition of the soda-felspar abounding in the rocks, by means of hot gases and waters, and the subsequent percolation of these into the valleys.

To-morrow will close the meeting. To-night there will be a session of "Section Q," which is the burlesque upon the serious proceedings, usually perpetrated by some of the younger and more irreverent members. It has had the wind taken out of its sails somewhat this year by the appearance last week of a very clever pamphlet, purporting to describe the doings of the "Trojan Society for the Retardation of Science," and filled with capital hits upon prominent members and their hobbies. Everybody has laughed at it, and charged it on BARKER, of Yale, who, I believe, has not successfully denied it.

V.

The final general session of the association took place Wednesday. Professor ASA GRAY, of Cambridge, is the next president, Professor BARKER, of Yale, vice-president, and Mr. PUTNAM, of Salem, secretary.

If the East seems to be exclusively honored in the choice of officers this year, it must be remembered that science knows no local lines, and furthermore, that the presidents for the past two years have been from the West—FOSTER, of Chicago, and CHAUVENET, of St Louis. The selection of Professor GRAY is one which cannot fail to be satisfactory to the scientific men of the country. His eminence is as unquestioned as his amiability, and the distinction which he deserves is one which it honors and delights his associates and admirers to confer upon him. Professor BARKER is a comparatively young man, but one of the most advanced chemists in the country. His social qualities and love of fun are combined with great acquirements and enthusiasm in science. It was a curious spectacle in section A, the other day, when he delivered his brief paper on molecular classification, to see the close interest and cordial applause bestowed upon him by the assembled chemists on one hand, and the ladies of Troy on the other—the latter having turned out in force to show their appreciation of the best beau in the association. Indianapolis has been chosen as the place for the next meeting. I think the selection will be justified by a hearty reception and a successful meeting. Professor E. T. COX, State geologist of Indiana, who is present at this Troy meeting, urged the acceptance of the invitation from that city, promises a pleasant and profitable time.

I have omitted to notice the paper of AGASSIZ, read in his absence by his assistant, Professor PERRY, on the local glaciers in the White Mountains. It contained little that was not already known to the public through other publications from the same source. The fact is that glacial theories and observations, after having been for some years the most exciting topics before the association, appear to have lost their interest for the majority of the members. The few papers on these subjects presented at Troy fell comparatively dead, and palæontology and zoölogy attracted a livelier attention. This is partly because those departments were more numerously represented this year, and partly because the glacial business has had the romance taken out of it. Bold and ingenious speculations have been made. The continent—one might almost say the hemisphere or the world—has been covered (in theory) with an enormous depth of ice; and this gorgeous envelope of fancy has melted away under discussion, leaving the prosaic work of noting scratches, counting boulders, and digging gravel—occupations which are in themselves more monotonous than the study of fossils, animals, plants or crystals.

There are waves and tides of fashion in science, as in literature and dress. Just now it is the Darwinian tendency which lends new interest to old facts in natural history, and busies the philosophers. The traces of the antiquity of man are likewise followed up with great zeal; and many of the earlier discoveries on this head, once shelved as doubtful or inadequate, are taken down again, and presumed all at once to be genuine and conclusive. Nor can we justly complain of this change in the temper of the scientific world. Evidence which was very doubtful when it stood alone acquires greater probability and force when it is corroborated; and the bluff at Vicksburg, like the shaft in Calaveras county, may both have been liars, and yet told a true story. Their added respectability is due to the increasing company in which they find themselves.

But there must be an end to this gossip; and I will merely sum up the results of this meeting of the association. There is but one verdict as to the character of the meeting. It was completely successful. In spite of the absence of many great names, the proceedings maintained a high degree of excellence and interest—a fact which speaks volumes for the future of American science. For every veteran who retires from active service we have a dozen ardent young soldiers, equipped from the outset with the perfected weapons and the thorough training of the new time. The names of our pioneers will never be eclipsed, but their work will be carried forward with greater speed and to greater results by the army of their successors. Indeed, the savant of the coming generation, if he would attain the glory earned by his predecessors, must accomplish more than they, in proportion as his means are more complete, and the competition of his co-laborers more intense and manifold. The circle of knowledge extends daily, and it requires as much study to reach the frontier, where others already stand, as was formerly necessary to penetrate the realm outside, and discover what was before unknown. But as the circle grows, the edge from which we may plunge into the outside spaces grows also; and the increasing number of explorers finds increased room along the verge. We need not fear that everything has been found out, nor lament that our great philosophers, one by one, pause or disappear. The ranks are still full, and the reinforcements are abundantly at hand.

The reception given to the association by the Trojans has been sufficiently characterized. It will be hard for other cities to devise anything more thoroughly cordial and agreeable. I ought also to bestow a word of merited praise upon the energy of the Troy newspapers, which furnished excellent reports of the proceedings with marvellous promptness.

One feature of such meetings has not been publicly commented upon, and is nevertheless of great practical importance to scientific men. Persons in charge of educational institutions have frequently found that men whose writings indicate scientific ability are not always qualified in other respects to be professors and teachers. Moreover, it often happens that men acquire local reputations which impose upon the city an unduly exaggerated impression of their true standing.

Meetings like those of the association afford a capital opportunity to learn, by observation, personal acquaintance and inquiry, the value of a man, and the estimate in which he is held by the best judges of his specialty. It can easily be seen by his papers and debates, and by his behavior among his peers, whether he has the good address, the power of clear, practical, attractive talking, the personal magnetism, which will make him invaluable as an instructor; and it is almost as easy to discover whether his relations with other men of science, are free from petty jealousies, and based upon genuine mutual esteem. These things are worth knowing, and this is the place to learn them, as the practice of several shrewd employees of scientific men sufficiently indicates.

VI.

THE BESSEMER WORKS.

There is a good deal of nonsense talked about the Bessemer process. Its product is frequently compared with cement or blister steel, and with cast steel, whereas it is neither chemically nor physically steel at all, but a very pure, homogeneous, somewhat highly carbonized wrought iron. This fact was admirably brought out in the paper of Lieutenant DUTTON, read before the association, and summed up in the words that the Bessemer, or pneumatic process, is a method of making cast wrought-iron. It is to be compared, therefore, with the puddling process, from which it does not essentially differ in chemical reactions, though the two are as unlike in mechanical means as could well be conceived. In puddling furnaces the oxydation and removal of the impurities of the pig-iron are effected by a reverberatory flame, accompanied by constant stirring of the charge. The great trouble is, that as the carbon burns out of the cast-iron and it approaches the condition of wrought-iron, the fluidity of the charge rapidly decreases, since the melting point of wrought-iron is considerably higher than that of pig—too high, in fact, for the temperature of the puddling process. Consequently, the iron coagulates and segregates in granules and lumps, like "butter out of the buttermilk in a churn," as DUTTON well says. The spongy masses which finally result cannot possibly be as homogeneous as fluid, and even after passing through the squeezers, to express the enclosed impurities, may still contain portions of slag, besides which their consolidation by pressure into workable shapes cannot be so complete as that effected by a cast.

The Bessemer process effects both the mechanical stirring and the chemical purification, (oxydation of carbon, silicon, etc.) by the agency of a powerful blast of air, passing through numerous small perforations in the bottom of the converter; and this blast, at the same time, maintains throughout the process an enormous temperature, rising sometimes to 5,000° Fahrenheit, by which an extreme fluidity of the charge is secured at every stage. The product, therefore, is directly cast into moulds, and requires no further purification.

The use of ferro-manganese, or spiegeleisen, at the conclusion of the heat, is what has led to the popular notion that the product of the pneumatic process is steel. The spiegeleisen does not, indeed, reintroduce a small amount of carbon into the almost entirely decarbonized iron of the fluid charge, but this amount is far too small (at the Troy works only about one-fifth of one per cent.,) to entitle the result to the name of steel.

QUALITY OF THE BESSEMER METAL.

There is little significance in names, however. The great point is, that the Bessemer metal is better adapted than steel to resist many kinds of strain. This is especially true of railway strains, which true steel would but poorly resist. The recent absurd dictum of the *Tribune*, that the Bessemer product is a failure, because it will not make good tools, shows how dogmatic is ignorance. If it were fit for tools, it would be the worst possible material for rails. If the Bessemer metal is called steel, it must be described as a very soft variety, containing but one-quarter of one per cent. of carbon.

HOW THE WORK IS DONE.

But I set out to give you rather a description of the works than a discussion of the method. A large party of us availed ourselves, the other day, of the cordial invitation of Mr. A. L. HOLLEY, the manager of the Bessemer works of JOHN A. GRISWOLD & Co., to witness a Bessemer "heat." As we entered the converting-room, 110 by 90 feet in size, with a lofty roof, the workmen were engaged in hoisting out of the moulds the glowing ingots from a previous heat, and depositing them on the sandy floor to cool, or loading them upon a railway truck for removal. The lifting was performed by cranes, which seemed to operate without direction, and, with almost human intelligence, now descending and now rising or turning, as the handling of the 1,400 pound ingots required. Soon we noticed at the farther end of the room an elevated platform, with a railing, behind which was a row of brake-wheels, like those on a railroad car. Here stood several workmen, their hands upon the wheels, and the vigilant eyes of each upon the distant crane, which it was his business to control and guide. Thus, with a touch of the hand, the power of the hydraulic machinery was communicated to the lift. The pressure on the water used in moving the seven lifts and cranes and the two huge converters, is 300 pounds per square inch. It is not too much to say, that without the aid of hydraulic machinery, the Bessemer process would be economically impracticable.

THE CONVERTERS.

Our attention was at once attracted by the two five-ton converters. It is difficult to describe these so as to give a clear notion to one who has not seen them, but I will make a desperate attempt. Imagine a huge iron vessel, 14½ feet high and 9 feet in diameter externally, cylindrical in form at the middle, and contracting in hemispherical curves above and below. The lower hemisphere is truncated, giving a flat bottom, say five or six feet in diameter, of which more presently. The upper hemisphere terminates in a large neck inclined sidewise, so that a flame issuing under pressure from the mouth would not be vertical, but obliquely directed; and, when the converter is in an upright position, the flames will enter the chimney, guarded by a hood. The whole vessel has a rude resemblance to a pear. It is supported by heavy trunnions on each side of the centre, and revolved upon these by hydraulic power. A boy at one of the wheels on the remote platform before mentioned, swings the ponderous mass about its axis with ease, performing, by the aid of machinery, the work of fifty men.

We may consider the converter as a huge iron bottle, with its neck awry, lined with a foot of refractory silicious material, and rotating at will upon an axis at right angles with its length. It is in this bottle that the melted pig-iron is to be exposed to a fierce agitation and oxidation by means of a blast of air, and thus, the carbon and silicon being burned out of it, converted into malleable iron. Evidently the only place where the blast can be introduced is through the trunnions, since these are the only points in contact with the solid supports. Accordingly, the trunnion is hollow, and a passage from it runs down the outside, looking like a strong rib in the iron surface, to the bottom, where it communicates with the tuyeres. The bottom of the converter is movable, (an improvement introduced to facilitate repairs by Mr. HOLLEY,) and when taken out looks like a great plug of fire brick, two feet high, resting upon a cast-iron disk. The tuyeres, or nozzles for the blast, are imbedded vertically in the lining, and present ten groups, each containing a dozen three-eighths inch holes. The aggregate area of these openings is equal to that of a single tuyere 4.1 inches in diameter, but the thorough agitation produced by dividing the blast secures much greater useful effect. The pressure of the blast is twenty-five pounds per square inch. "This mechanical action," says Mr. HOLLEY, "the numerous and violent air-blasts as a means of promoting the chemical reaction, is the essence of the Bessemer process."

When we arrived, one of the great converters was turned on its side, and we could see into its red throat. It was cooling down a little, preparatory to the removal of the burned-out bottom and the insertion of a new one. The other was moderately spouting fire, undergoing the reverse process of heating up, preparatory to a blast. In a few minutes the interior was hot enough, and the unwieldy monster, turning its mouth downward, vomited out the glowing coals which it had been digesting. Then it turned upon its side, and the end of a trough was brought opposite its fiery lips. This trough we could trace back, up a steep incline to the half distinguished breast of a cupola furnace on the floor above. An instant more, and a white stream of molten iron comes leaping down with coruscating showers of starry sparks, and plunging into the mouth of the converter. (The position of the vessel at this time prevents the charge from running into the tuyeres before the blast begins. Afterwards the pressure of the air itself keeps the passages clear.)

INTENSE HEAT AND LIGHT OF THE BLAST.

Then the blast was let on, and the converter swung back to a vertical position. A tongue of white flame came roaring out

of the mouth, dazzling our unaccustomed eyes. But neither the brilliancy nor the temperature of the flames was as great at first as they became shortly after. The silicon of the pig oxidizes first, without very intense flame ; but as the graphite and especially the combined carbon, begin to burn also, the heat rises to some 5,000° Fahrenheit, and the light is so brilliant as to cast shadows across full sunshine. A professor in our party had brought a spectroscope, through which we examined the flame with curiosity. The principal line indicated was that of sodium, which must have been due to the material of the lining. Some other lines flashed out momently, now and then, and disappeared, masked in the continuous spectrum of the white-hot gases.

In fifteen or twenty minutes, the marvellous illumination ceased more suddenly than it had begun. The volume and brilliancy of the flame diminish together with startling rapidity. So great is this almost instantaneous change, that it can be discerned "in the night time," says Lieutenant DUTTON, "at a long distance from the foundry, and from any position commanding a view of the tall chimney, or even of the glare from the doorways, no direct view of the flame being necessary." This change of the Bessemer flame is still a puzzle to chemists. It does mark, it is true, the elimination of most of the carbon, but not of all ; and it is inexplicable that the combustion should cease so suddenly while there is yet fuel left. Theory apart, however, the critical moment in practice is indicated by this change. When it arrives, the blast is stopped, the converter is turned upon its side, and 600 pounds of melted spiegeleisen are turned into it, as the pig was previously charged. The reaction is instant and violent. The manganese of the spiegeleisen combines with any sulphur that may remain in the bath, forming compounds which pass into the slag. It also decomposes in the slag silicates of iron, taking the place of the iron and returning it to the bath. Finally, the carbon and manganese together reduce the oxide of iron formed during blowing, which would destroy the malleability of the iron.

THE DISCHARGE.

All this is done in shorter time than I occupy in describing it ; and now the gigantic converter, like a monster weary with drinking boiling iron and snorting fire, turns its mouth downward, and discharges its contents into a vast kettle, or ladle, brought underneath for the purpose by one of those intelligent cranes, that stand around so silent and so helpful. The ladle is swung over the moulds, and the white, one would almost say transparent, metal is drawn off into these through a tap-hole in the bottom. The heat is over. Five tons of cast wrought-iron, (or soft steel, if you will,) have been made in twenty minutes. The actual production of these works is 1,000 to 1,200 tons of ingots per month, which is nearly twice as much as that of an English plan of the same capacity of converter. The difference is due to the admirable arrangements and improvements of Mr. HOLLEY, which greatly reduce the loss of time in repairs and handling. The number of workmen now employed is 200. The capacity of the whole works, when the blooming-mill is completed, will be about 18,000 tons of blooms per year.

R.

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106,760.—TRUSS-BRIDGE.—John S. Adams, Elgin, Ill.
106,761.—NECK-TIE.—Moritz Altman, Baltimore, Md.
106,762.—LUBRICATING-BOX.—Chas. Andrews, Providence, R. I.
106,763.—GATE.—Thomas Andrews, Warren, Wis.
106,764.—STREET-LAMP.—Theodore P. Austin, New York, N. Y.
106,765.—COMBINED HARROW AND ROLLER.—Timothy Bailey, Wyoming, Ill.
106,766.—WATER-WHEEL.—Vincent M. Baker, Preston, Minn.
106,767.—WOOD-TURNING LATHE.—Frederick Baldwin, Janesville, Wis.
106,768.—SHAFT-COUPLING.—Marshall S. Bassett, West Haven, Conn., assignor to himself and Leonard H. Burt, same place.
106,769.—MACHINE FOR BENDING FORKS.—Isaac Gale Batcheller, Wallingford, Vt.
106,770.—CURTAIN-CORD TIGHTENER.—John E. Baum, Philadelphia, Pa.
106,771.—FIRE-PROOF RAILWAY-CARS.—Geo. C. Bestor, Peoria, Ill.
106,772.—FIRE-PLACE GRATE.—Frank S. Bissel, Pittsburgh, Pa.
106,773.—TOOTH-PICK.—William E. Blake, New York, N. Y.
106,774.—SHUTTLE STOPPING DEVICE.—Theodor Bosshard, Columbus, Ohio.
106,775.—MACHINE FOR UPSETTING TIRES.—William Bowden, Hamburg, N. Y., assignor to himself and Abbot C. Calkins, same place.
106,776.—WARDROBE BEDSTEAD.—Sanford S. Burr, Boston, Mass.
106,777.—STEAM-ENGINE.—Henry L. Butler and Thomas A. Christie, Pittsburgh, Pa. ; said Christie assigns his right to said Butler.
106,778.—PAPER-FILE.—John Cash and Joseph Cash, Jr., Coventry, England,
106,779.—SPADE AND SHOVEL.—Jacob Caylor, Half Way, Ind.
106,780.—VELOCIPEDE.—John C. Clime, Philadelphia, Pa.
106,781.—DRIVING MECHANISM FOR SEWING-MACHINES.—John Cochrane, Jr., Malden, Mass.
106,782.—CIRCULATING WATER-HEATER FOR STEAM FIRE-ENGINES. Henry V. Coleman, Chicago, Ill.
106,783.—SCAFFOLDING.—James V. Cook and Edward J. Crossman, Auburn, N. Y.
106,784.—MANUFACTURE OF PAINT AND VARNISH.—Geo. Frederick Cornelius, Westminister, Great Britain.
106,785.—BOOK MARKER.—Edmund Cottle, Randolph, Mass.
106,786.—RAILROAD-CAR DUSTER AND VENTILATOR.—John Penn Curry, New York, N. Y.
106,787.—WATER-WHEEL.—Dwight Cushman, Hartman, Conn.
106,788, antedated August 17, 1870.—GATHERING DEVICE FOR SEWING MACHINES.—Job A. Davis, Watertown, N. Y.
106,789, antedated August 26, 1970.—CREASING ATTACHMENT FOR SEWING MACHINE.—Job A. Davis, Watertown, N. Y.
106,790.—MUSICAL ROCKING CHAIR.—Clayton Denn, Frankford, Philadelphia, Pa.
106,791, antedated August 24, 1970.—ADJUSTMENT FOR PUMP-RODS.—Byron Densmore, New York, N. Y.
106,792, antedated August 24, 1879.—WATER METER.—Byron Densmore, New York. N. Y.
106,793.—REMOVING DEPOSITS FROM OIL-WELLS.—James Dickey, Venango City, Pa.
106,794.—TORPEDO FOR OIL WELLS.—James Dickey, Venango City, Pa.
106,795.—PENCIL SHARPENER.—Moses W. Dillingham, Amsterdam, N. Y.
106,796.—TENSION DEVICE FOR SEWING-MACHINE.—George L. Dulaney, Mechanicsburgh, Pa.
106,797.—ROLLER TEMPLE FOR LOOMS.—Warren W. Dutcher, Hopedale, Mass., assignor to the Dutcher Temple Company, same place.
106,798.—TRAP FOR LOWERING ICE.—Charles Egnor, Catskill, N. Y.
106,799.—GANG PLOW.—Abram Ellison, Marysville, Cal.
106,800.—MARINE ENGINE.—John Ericson New York, N. Y.
106,801, patented in England, April 25, 1870.—MAXIMUM AND MINIMUM WATER GAUGE.—George Jordan Firmin, No. 19 Lorn Road, North Brixton, England.
106,802, antedated August 18, 1870.—PORTABLE SPRINKLER.—Warren L. Fish, Springfield, Mass.
106,803.—MACHINE FOR FORMING SHEET METAL MOLDINGS.—Henry G. Fiske, San Francisco, Cal.
106,804.—ROTARY STEAM-ENGINE OR PUMP.—George Stores Folianbee, Philadelphia, Pa., assignor to himself and John Rosencrantz, same place.
106,805.—FOLDING SEAT.—Charles A. French. Lowell, Mass.
106,806.—COMBINED PLANTER AND SEEDER.—William E. Fricke, Mexico, Mo,
106,807.—CAR-COUPLING.—James H. Froman, Plattsburg, Mo.
106,808.—PLANE-GUIDE.—Michael Garland, West Eau Claire, Wis.
106,809.—LOOM.—Lucien M. Gilbert, Cow Run, Ohio.
106,810.—TOBACCO-RIDGER.—Ozias W. Goslee, Glastenbury, Conn.
106,811.—MILK-COOLER.—Warren H. Gould, Manchester, N. H.
106,812.—FIRE ESCAPE.—John A. Griswold, Chicago, Ill., assignor to himself and Phineas E. Merrihew, same place.
106,813.—TREADLE-MOTION.—Chas. M. Guess, New Orleans, La.
106,814.—BOOT AND SHOE-HEEL.—Henry F. Harris and Gaylord P. Pinney, Chicago, Ill.
106,815.—ESCAPEMENT FOR WATCHES, &c.—William Hart, Kirksville, Mo.
106,816.—MEASURING FAUCET.—Francis C. Heiser, Brooklyn, N. Y.
106,817.—CARRIAGE.—John R. Hiller, Woodland, Cal., assignor to himself and Clark Elliott, same place.
106,818.—LIME KILN.—David Hills, Richville, N. Y.
106,819.—COVERING METAL ARTICLES WITH INDIA RUBBER.—Constantine Hingher, New Brunswick, N. J.
106,820, antedated August 26, 1870.—LOW WATER INDICATOR.—George M. Hopkins and John A. Straight, Albion, N. Y.
106,821, antedated August 13, 1870.—LOW-WATER AND HIGH-PRESSURE INDICATOR.—George M. Hopkins and John A. Straight, Albion, N. Y.
106,822.—BOOM CROTCH SUPPORTER.—Hiram Hopkins, Wellfleet, Mass.
106,823, antedated August 19, 1870.—COLORING GUN-BARRELS. James Spooner Howard, Mansfield. assignor to himself, T. E. Grover, same place, E. Adams, Jr.. and N. Carpenter, Attleborough, Mass.
106,824.—PROPELLER.—Lewis Howard and Charles Howard, Watkins, N. Y.
106,825.—ROOFING.—Seymour Hughes, Hudson City, N. Y.
106,826.—PORTABLE FENCE.—Eli Hunt, Hartford, Ind.
106,827.—BARREL.—George M. Huntly, Grand Rapids, Mich.
106,828.—FLUTING AND SAD-IRON.—Charles Hyatt, Buffalo, N. Y.
106,829.—WIRE CUTTER.—Joseph Johnson, Marshalltown. Iowa.
106,830.—LOCK FOR THE MEETING RAIL OF SASHES.—Frederick W. Judd and George M. Hubbard, New Haven, Conn.
106,831.—FANNING MILL.—Daniel Kane, Tivoli, Iowa.
106,832.—PAVEMENT.—John Stafford Kelley, New York, N. Y.
106,833.—COTTON PRESS.—William W. Knowles, Bastrop, Texas.
106,834.—MACHINERY FOR PRINTING OIL CLOTH, &c.—Joseph Kraft, Newark, N. J.
106,835.—DOOR-STRIP.—John W. Kramer, Bloomsburg, Pa.
106,836.—CHURN.—Hermann Kuhlmann, Cincinnati, Ohio.
106,837.—COMBINED PLOW AND CULTIVATOR.—Jacob M. Landes, Scuders, Pa.
106,838.—MANUFACTURE OF PLOW-SHARES.—John Lane, Chicago, Ill., assignor to himself, Charles H. Hapgood, W. B. Young, and George H. Laughton, same place.
106,839.—SUGAR-CANE SCRAPER.—Alcide Landry, East Baton Rouge, La.
106,840.—CALL-BELL AND VESSEL.—Nathan Lawrence, Taunton, Mass.
106,841.—ELEVATOR.—Alfred Lawton, Philadelphia, Pa.
106,842.—BEDSTEAD TESTER.—Francis Layaux, Monroe, La.
106,843.—CLOCK ESCAPEMENT.—Benjamin B. Lewis, Bristol, Conn., assignor to himself and Welch, Spring & Co.
106,844, antedated August 25, 1860.—REEL FOR DYEING AND FINISHING SILK AND VELVET WOOLEN FABRICS.—Edward Mafat, New York, N. Y.
106,845.—CONSTRUCTION OF BRUSHES.—John Marchbank, Lansingburg, N. Y.
106,846.—MEDICAL COMPOUND.—Ann Augusta Marsh, Frankfort, Mich.
106,847.—SAFETY CAR-BRAKE.—Anthony S. Martin, Washington, D. C.
106,848.—CHURN.—George H. McGlothlin, Charlton, Iowa.
106,849.—COMBINED LOCK-NUT AND SPLICE-BAR.—Robert L. McGowan, New Brighton, assignor to himself, Charles A. Woods, Pittsburg, Pa., John Fletcher, Ravenna, Ohio, and Thomas Johnston, Allegheney, Pa.
106,850.—MOLDING FLASK.—John McLaughlin, Philadelphia, Pa., assignor to himself and Jacob Apple, same place.
106,851.—TREATMENT OF GUANO AND THE MANUFACTURE OF FERTILIZERS.—Campbell Morfit, New York, N. Y.
106,852.—WATER-METER.—Andrew Morse, Skowhegan, Me.
106,853.—WASHING-MACHINE.—Russel S. Morse, Chelsea, Mass.
106,854.—IRON BUILDING.—Thomas W. H. Moseley, Boston, Mass.
106,855.—BRIDGE.—Thomas W. H. Moseley, Boston, Mass.
106,856.—HOOD FOR PLANING MACHINE.—Barker D. Mott, Green Island, assignor to himself and Harcourt Mott, Troy, N. Y.
106,857.—LUBRICATOR.—Charles Nelson, Brooklyn, E. D., N. Y.
106,858.—ANIMAL TRAP.—Abner Newton, Darby Creek, Ohio.
106,859.—COTTON-SEED PLANTER.—Henry Nichols, Fairfield, Ky.
166,860.—OSCILLATING STEAM-ENGINE.—August Nittinger, Jr., Philadelphia, Pa,
106,861.—COMBINATION SIDE DOOR.—Charles Horace Noyes, Brooklyn, N. Y.
106,862, antedated August 25, 1870.—AERIAL CAR.—Edward Oakes, Richmond, Ind.
106,863.—APPARATUS FOR PRODUCING GAS FROM COAL.—Timothy O'Mears, Brooklyn, N. Y., assignor to himself, James F. Preston, Robert M. Fryer, Dwight Marcy, and Andrew R. Fryer, assignors to United States Gas Company, Rockville, Conn.
106,864.—CULTIVATOR.—Benjamin F. Osborn, Nashville, Tenn., assignor to T. H. Jones & Co., same place.
106,865.—EARTH-SCRAPER.—Silas S. Owen, Stewartsville, Mo.
106,866.—LAMP-SHADE HOLDER.—Thomas Brower Peacock, Dresden, Ohio.
106,867.—OPERATING VALVE.—Abraham L. Pennock, Upper Darby, Pa.
106,868.—CARPENTERS' PLANE.—Russel Phillips, Boston, Mass.
106,869.—SCALE FOR SHOWING WEIGHT AND PRICE.—William H. Phinney Pawtucket, R. I.
106,870.—WASHING-MACHINE.—John Prehn, New York, N. Y.
106,871.—CLEANSING WOOL.—Emil F. Richter, Berlin, Prussia.
106,872.—PRESS FOR STENCIL-PRINTING.—Henry W. Rudolph, Louisville, Ky.
106,873.—TREADLE MOTION.—Geo. B. Safford, Burlington, Vt.
106,874.—STAVE-JOINTER.—James F. Sayer, Macomb, N. Y.
106,875, antedated August 19, 1870.—COMPOUND OR "ROUGH STUFF TO BE APPLIED TO CARRIAGE BODIES, &c.—Edward Scharnikow, Margarettville, N. Y.
106,876.—CATTLE-STANCHION.—John D. Scott, Alviso, Cal.
106,877.—COMPOSITION FOR BLACKING STOVES, &c.—Thomas C. Scottron and Sidney Plummer, Springfield, Mass.
106,878.—LIQUID METER.—Henry C. Sergeant, Newark, N. J., assignor to William Tobin, New York City.
106,879.—MEAT-CHOPPER.—Albert R. Silver, Salem, Ohio, assignor to himself and John Deming, same place.
106,880.—MACHINE FOR BENDING WOOD.—James K. B. Solomon, Riggiesville, Pa.
106,881.—ADDING MACHINE.—Charles E. Spear, Gardiner, Me., assignor to Eugene Humphrey, Chelsea, Mass.
106,882.—PROCESS FOR MANUFACTURING PLUG TOBACCO.—Lewis W. Spencer, New York, N. Y., assignor to Peter Lorillard, same place.
106,883.—PLUG-TOBACCO MACHINE.—Lewis W. Spencer, New York, N. Y., assignor to Peter Lorillard, same place.
106,884.—VALVE FOR PNEUMATIC DRAW IN ORGAN.—Adam Stein, Westville, Mass.
106,885.—COMBINED STOCKING SUPPORTER AND SKELETON WAIST. Augusta M. Stiger, Brooklyn, N. Y.
106,886, antedated August 18, 1870.—CORNISH ENGINE.—John Storer, Peekskill, N. Y.
106,887.—STOCK-CAR.—Zadok Street, Salem, Ohio.
106,888.—STOCK-CAR.—Zadok Street, Salem, Ohio.
106,889.—COMBINED FURNACE AND TEA-KETTLE.—Cebra L. Taylor and George C. Setchell, Greenville, Conn.
106,890.—CURTAIN-FIXTURE.—Chas. M. Thielcke, Chicago, Ill.
106,891.—HARVESTER.—John S. Truxul, Greensburg, Pa.
106,892.—COMPRESSED-AIR FORGE-HAMMER.—Chas. Vogel, New York, N. Y.
106,893.—HAY AND COTTON-PRESS.—Marshall Wallace, Little Rock, Arkansas.
106,894.—MITER-MACHINE.—Daniel B. Ware, Athens, Mich.
106,895, antedated August 24, 1870.—EXTENSIBLE GAS-PENDANTS. George Warner, Des Moines, Iowa.
106,896.—SEEDING-PLOW AND PLANTER.—James B. Watt and John C. Watt, Greene County, Ohio.
106,897.—KNIFE AND FORK-CLEANER.—Herman Wegner and Friedrich Wagner, West Troy, N. Y.
106,898.—CORN PLANTER.—Lewis West, Georgetown, Ky.
106,899.—STEAM-ENGINE AND PUMP.—George Westinghouse, Jr., Pittsburg, Pa.
106,900.—CLAMP.—Levi Wharton, Salem, Ohio.
106,901.—HEEL ROUNDING MACHINE.—John C. White, Auburn, N. Y.
106,902.—BRUSH.—John L. Whiting, Boston, Mass.
106,903, antedated August 18, 1870.—HARVESTER.—Daniel D. Whitker, New York, N. Y., assignor to James McGhee for one half the invention.
106,904.—PUMP.—Martin Wilcox, Sacramento, Cal.
106,905.—MEDICAL COMPOUND.—William M. Wilson and Dallas S. Denton, Polk county, Mo.
106,906.—FOLDING-TABLE.—Albert Windeck, Peoria, Ill.
106,907.—APPARATUS FOR TREATING CLUB FEET.—George B. Wood, Chicago, Ill.
106,908.—HARROW.—Stephen Woodard and Albert Woodard, Saratoga, Ind.
106,909.—BLACKING-BOX AND BRUSH.—Chas. E. Yager, Hudson, N. Y.
106,910.—WOOD PAVEMENT.—Henry J. Alvord, Washington, D. C., assignor to himself and Charles E. Bishop, same place.
106,911, antedated August 25, 1970.—CEMENT.—Daniel Arndt, Cleveland, Ohio.
106,912.—MACHINE FOR PACKING FLOUR.—Benjamin F. Bashor, Carter's Depot, Tenn.
106,913.—TRACK-LIFTER.—Joseph M. Batcheler, Foxcroft, Me.
106,914.—HOISTING APPARATUS.—Michael K. Carpenter, Cincinnati, Ohio.
106,915.—TREATING ACID TAR FROM COAL.—Gervais Chevrier, Paris, France.
106,916.—HAY-LOADER.—David Clagett, Hagerstown, Md.
106,917.—AUTOMATIC GATE.—James B. Cottom, Dayton, Ohio.
106,918, antedated August 19, 1870.—FERTILIZER.—Benjamin R. Crossdale, Philadelphia, Pa.
106,919.—HOLLOW AUGUR.—Austin F. Cushman, Hartford, Conn.
106,920.—FASTENING FOR GARMENTS.—Joseph Edward Dallon, Brooklyn, N. Y.
106,921.—CASE-STAND.—Alexander De Puy, New York, N. Y., assignor to R. Hoe & Co., same place.
106,922.—DOVETAILING MACHINE.—Joseph Dill, Grand Rapids, Mich.
106,923.—LIQUID SLATING FOR FORMING BLACK-BOARDS, &c.—William W. Dudley, Centreville, Ind.
106,924.—APPARATUS FOR THE MANUFACTURE OF ELASTIC FABRICS. Charles A. Ensign, Naugatuck, Conn.
106,925.—COMBINED SPOOL AND NEEDLE THREADER.—George Penrice Farmer, Philadelphia, Pa.
106,926.—STUMP-EXTRACTOR.—Enoch Farnsworth, Sabbath Rest, Pa.
106,927.—APPARATUS FOR SATURATING FELLIES WITH OIL.—Joshua R. Faus, Espy, Pa.
106,928.—SASH FASTENER.—Henry Fickel, Dayton, Ohio, assignor to himself and David G. Brown, same place.
106,929.—CHURN.—Moses Gascon, Malvern, Ohio.
106,930.—MACHINE FOR TONGUING AND GROOVING.—Peter Geiser and L. P. Thompson, Waynesborough, Pa. ; said Thompson assigns to said Geiser.
106,931.—MACHINE FOR ROUNDING FELLIES FOR WHEELS.—Henry A Gore, Goshen, Ind.
106,932.—HEAD-BLOCK.—Henry H. Grindley, Auburn, N. Y.
106,933.—TACKLE-BLOCK.—Joseph F. Harcourt, Cincinnati, Ohio.
106,934.—CORSET SPRING.—Thomas A. Hares, New York, N, Y. assignor to himself and Cornelius Van Ness, same place
106,935.—CHURN DASHER.—John Harris, Palestine, Ill.
106,936.—CAR-COUPLING.—Charles M. Hoag, Nassau, N. Y.
106,937.—SASH AND BLIND MACHINE.—Randolph D. Hobart, Binghamton, N. Y., assignor to himself and J. V. Simmons, same place.
106,938.—DIE FOR FORMING EYELETS.—Esek Tallman and G. Hoxsie, Providence, R. I., administrators of David K. Hoxsie, deceased, assignors to Waterbury Brass Company and American Flask and Cap Company, Waterbury, Conn.
106,939.—MACHINE FOR CUTTING OUT THE ENDS OF EYELETS.—Esek Tallman and Nicholas G. Hoxsie, Providence, R. I., administrators of David K. Hoxsie, deceased, assignors to Waterbury Brass Company and American Flask and Cap Company, Waterbury, Conn.
106,940.—RAILROAD-CAR VENTILATOR.—Wm. H. Hunt, Bolton, Conn.
106,941.—BUREAU.—Cheney Kilburn, Philadelphia, Pa.
106,942.—FASTENING FOR POLICEMEN'S BADGES.—Thomas Kirkpatrick, New York, N, Y.
106,943.—SEWING-MACHINE.—Jenny L. Lake, Brooklyn, N. Y.
106,944.—VAPOR-BATH APPARATUS.—Ursula L. Leete, Owego, N, Y.

106,944.—MACHINE FOR CUTTING AND BINDING GRAIN.—Sylvanus D. Locke, Janesville, Wis.
106,946.—COOKING-STOVE.—William B. Mackenzie, Cincinnati, Ohio.
106,947.—SHIFTING CARRIAGE-TOP.—Orson E. Mallory, Batavia, N. Y.
106,948.—HARVESTER CUTTER.—Henry W. Mason, Hagerstown, Md.
106,949.—REVOLVING GRAIN SCREEN.—Francis Mills, Mount Vernon, Ind.
106,950.—FEEDER FOR GRAIN DRILL.—Michael Lewis Nickels, Duolapsville, Ind., assignor to himself and Thomas Nickels, same place.
106,951.—MACHINE FOR MAKING WIRE BELLS.—Russel W. Norton, New Haven, Conn.
106,952.—PACKAGE FOR TEA AND COFFEE.—Henry Odenkirchen, New Haven, Conn.
106,953.—RAILWAY-CAR SEAT.—John M. O'Neill, Clinton, Iowa.
106,954.—BED BOTTOM.—Otis S. Osgood, Burlington, Iowa.
106,955, antedated August 25, 1870.—LATCH FOR GATES, &c.—William Patton, Towanda, Pa.
106,956.—CULTIVATOR.—Reuben L. Payne, Raceville, Va.
106,957.—WASHING MACHINE.—Lowell L. Peck, Portland, Oregon
106,958.—WATER WHEEL.—William S. Place, Charlestown, Me.
106,959.—LUBRICATOR.—Hugh Pringle, Green Point, N. Y.
106,960.—SAW MILL.—Chester Purdy, Bedford, Ohio.
106,961.—GRAIN BIN.—Fitch Raymond, Cleveland, Ohio.
106,962.—WATER WHEEL.—John R. Richardson, Newcastle, Pa.
106,963.—STAMP CANCELER.—George B. Rogers, Boston, Mass.
106,964.—APPARATUS FOR PITCHING BARRELS.—Louis Schulze, Louisville, Ky.
106,965.—STEAM GENERATOR.—Thomas Sharp and Charles S. S. Griffin, Salem, Ohio.
106,966.—PLOW.—Justin Malancen Smith, Haddam, Conn.
106,967.—SKY LIGHT.—Samuel P. Snead, Louisville Ky.
106,968.—APPARATUS FOR HEMING, &c., FOR SEWING MACHINES. William B. Snyder, Bridgeport, Conn., assignor to the Wheeler & Wilson Manufacturing Company, same place.
106,969.—AXLE FOR VEHICLES.—Albert J. Straight, Richland Centre, Wis.
106,970.—DESK.—Charles Wharton Titus, Philadelphia, Pa.
106,971.—BURNER FOR LOCOMOTIVE HEAD-LIGHTS.—Aaron C. Vaughan, Philadelphia, Pa., assignor to James M. Sellers and A. K. McClure, same place.
106,972.—FEED WATER-HEATER.—Gardner Waters, Cincinnati, Ohio.
106,973.—CONDENSER.—Friedrich Wegmann, Naples, Italy.
106,974.—PUMP-VALVE.—George M. Weinmann, Columbus, Ohio.
106,975.—STRAW AND FEED-CUTTER.—August Werner, Buffalo, N. Y.
106,976.—CORN PLANTER.—Lucius Winston, Pontiac, Ill.
106,977.—COATING TACKS AND NAILS WITH COPPER.—Howell W. Wright, Taunton, Mass., assignor to Albert Field Tack Company.
106,978.—MACHINE FOR ELONGATING AND SPREADING SAW-TEETH. John Orm, Paducah, Ky.
106,979.—HORSE-POWER APPARATUS.—Abraham Gaar, Richmond, Ind.
106,980.—SPRING FOR BEDS.—Charles Rich, Poughkeepsie, N. Y., assignor to himself and David S. Mallory, same place.

REISSUES.

4,109.—SPOKE MACHINE.—R. H. Boynton, Oshkosh, Wis.—Patent No. 52,130, dated January 23, 1866.
4,110.—Division A.—PUMP.—John Brokenshire, for himself, Kingston, Canada, and George Goble and J. D. MacFarlane, assignees of John Brokenshire, Oswego, N. Y.—Patent No. 80,905, dated August 11, 1868; reissue No. 3,280, dated February 2, 1869.
4,111.—Division B.—PUMP.—John Brokenshire, for himself, Kingston, Canada, and George Goble and J. D. McFarlane, assignees of John Brokenshire, Oswego, N. Y.—Patent No. 80,905, dated August 11, 1868; reissue No. 3,280, dated February 2, 1869.
4,412.—PARING-KNIFE.—John Jacob LeBeau, Cincinnati, Ohio. Patent No. 56,235, dated July 10, 1866.
4,413.—ANIMAL TRAP.—John A. Lee, Chattanooga, Tenn., assignor through mesne assignments, to Robert D. Maun.—Patent No. 83,642, dated November 3, 1868.

DESIGNS.

4,305.—CARPET PATTERN.—Jonathan Crabtree, Philadelphia, Pa., assignor to James Bromley & Brothers, same place.
4,306.—CARRIAGE.—Amzi S. Dodd, New York, N. Y.
4,307.—CLOCK CASE.—Robert Dunn, Brooklyn, N. Y., assignor to "Waterbury Clock Company," Waterbury, Conn.
4,308.—CLOCK CASE.—Robert Dunn, Brooklyn, N. Y., assignor to "Waterbury Clock Company," Waterbury, Conn.
4,309.—CLOCK CASE.—Robert Dunn, Brooklyn, N. Y., assignor to "Waterbury Clock Company," Waterbury, Conn.
4,310.—COAT AND HAT-HOOK.—Wm. R. Goodrich, Utica, N. Y.
4,311.—CARPET PATTERN.—Alfred Heald, Philadelphia, Pa., assignor to McCallum, Crease & Sloan, same place.
4,312.—CARPET PATTERN.—Alfred Heald, Philadelphia, Pa., assignor to McCallum, Crease & Sloan, same place.
4,313.—CARPET PATTERN.—Alfred Heald, Philadelphia, Pa., assignor to McCallum, Crease & Sloan, same place.
4,314.—CARPET PATTERN.—Alfred Heald, Philadelphia, Pa., assignor to McCallum, Crease & Sloan, same place.
4,315.—CARPET PATTERN.—William Kerr, Philadelphia, Pa., assignor to James Bromley & Brothers, same place.
4,316.—BOX FOR THE TOP OF BUREAUS.—Cheney Killburn, Philadelphia, Pa., assignor to Killburn & Gates, same place.
4,317.—HANDLE OF SPOONS, FORKS, &c.—John Polhamus, New York, N. Y.
4,318.—CUSPADORE.—Samuel Roebuck and John Roebuck, Brooklyn, N. Y.
4,319.—PLATE AND DOOR OF A COOKING-STOVE.—Isaac Applin Shoppard, Philadelphia, Pa.
4,320.—PORTABLE RANGE.—David Stuart and Lewis Bridge, Philadelphia, Pa., assignors to Stuart, Peterson & Co., same place.
4,321.—FRAME OF AN EMERY GRINDER.—Abijah Wallace, Stroudsburg, Pa., assignor to the Taulte Company, same place.
4,322.—CARRIAGE-BOOT.—Edward Wells, New Haven, Conn., assignor to Wells, Crittendeu & Co., same place.
4,323.—CARRIAGE-DOOR HANDLE.—Daniel W. Thomas, New York, N. Y., assignor to Henry Brewster, John W. Button, and James Lawrence, same place.

EXTENSIONS.

Extended by an Act of Congress, approved July 14, 1870.

JOHN BATCHELDER, of Boston, Mass.—Letters Patent No. 6,439, dated May 8, 1849; reissue No. 617, dated November 2, 1858; extended seven years; again reissued, No. 1,543, dated September 22, 1863, and again reissued, No. 2,125, dated December 12, 1865.—Improvement in Sewing-Machines.

RICHARD M. HOE, of New York, N. Y.—Letters Patent No. 15,501, dated August 5, 1856; reissue No. 3,893, dated March 22, 1870.—Improvement in Printing Presses.

A. D. WAYMOUTH, of Fitchburg, Mass.—Letters Patent No. 15,446, dated July 29, 1856.—Improved Machine for Manufacturing Spool's.

WILLIAM S. CARE, of New York, N. Y.—Letters Patent No. 15,474, dated August 5, 1856; reissue No. 978, dated June 12, 1860.—Improvement in Water-Closets.

HEZEKIAH BRADFORD, of Reading, Pa.—Letters Patent No. 15,544, dated August 12, 1856.—Improved Ore-Washer.

DAVID MUNSON, of Indianapolis, Ind.—Letters Patent No. 15,491, dated August 5, 1856.—Improvement in Lightning-Rods.

LEVI AVERILL, of Elmira, N. Y.—Letters Patent No. 15,549, dated August 19, 1856.—Improvement in Lime-Kilns.

J. HERVA JONES, of Rockford, Ill.—Letters Patent No. 15,610, dated August 26, 1856.—Improvement in Hand Seed-Planter.

A Valuable Collection of Fossils.

FROM an exchange, we learn that the collection made by LEO LESQUEREUX has left Columbus, Ohio, in forty-two boxes, and well soon be on the shelves of the great Museum of Comparative Zoölogy at Cambridge, Mass., founded by AGASSIZ, whose health, alas! no longer permits him to work for science. LESQUEREUX'S collection consists of more than four thousand specimens, some of them of great value. It represents, as no other can, the botany of the American carboniferous, cretaceous, and tertiary rocks—for the typical specimens of most of our American species are there. It has taken its distinguished collector twenty years—the term of his residence in America—to establish it; and all its specimens have passed through his hands, and under his microscope, many times, before receiving those names by which the learned world knows and shall always know them.

It is a fitting close for the historical career of such a stone-library, that it should find a resting-place in, and make another monumental portion of, the great scientific museum of the country; that LESQUEREUX'S plants should be displayed under the same roof as his friend and fellow-countryman AGASSIZ'S fishes. But has Philadelphia no great Museum of Natural History? Is not Pennsylvania more the Commonwealth of Coal, and the field for the study of coal plants, than any other State? To be indebted to Columbus, Ohio, or rather to Neufchatel, in Switzerland, for the master and teacher—in fact, founder—of the science of identifying coal beds by their fossil plants, is no shame; for science knows no country; and nature grows great geologists, here and there, capriciously, as it does uncommon trees and super-eminent mountain peaks. But that such a collection of coal plants, when once made, should enter Pennsylvania from Ohio, pass through Pittsburgh, Harrisburgh, and Philadelphia, in boxes, on a freight car, and disappear forever into New England, without an effort made by a single Pennsylvanian, by a single owner of coal property resident in Philadelphia to retain it, is not flattering to our self-respect.

Will it be said that no one in Philadelphia knew of its existence? That was a pity. We profess to have a high standard of education, no inconsiderable social cultivation, and good business judgment. Must we, then, depend on people of other States for special information respecting what concerns our own affairs? Is there no one drawing a large income from coal lands who comprehends the value of abstract science upon the practical interests of coal mining, in correcting errors, avoiding mistakes, indicating the lines of research, defining the laws of nature, and establishing rules for professional experts? Philadelphia, the great coal and iron centre, owes it to itself to have the finest school of mines in the world. Commercial New York, literary Boston, and religious New Haven, have the three best appointed mining schools in the country. Why should Philadelphia be behind the age? Why should Pennsylvania amble along, year after year, without a permanent, or even a temporary geological survey? Would it be credited in any country in Europe, that a city of 800,000 educated inhabitants should find it impossible to support its Academy of Natural Sciences? The wealthy citizens of Philadelphia can cheerfully afford $50,000 per annum to keep up the Union League, a club-house, devoted to the recreation of its members—an excellent institution, and one which does credit to the city; but certainly, now that the war is ended, belonging to a secondary order of public institutions; but Philadelphians have no heart to give even $10,000 a year to keep up a splendid exhibition of the wonders of nature and forms of life, extinct and existing. There ought to be cultivated intelligence enough among us to take such an interest in these noblest subjects of human life as would make our museum rival those of London, Paris, and Berlin, and absorb successively all such collections as the one which has just been lost to us forever, carried through our very streets, by the wise and liberal foresight of wealthy and cultivated Bostonians, to be added to that vast monument of Massachusetts civilization, the Museum of Comparative Zoölogy of the University of Cambridge. In a few years, the great collection of Dr. NEWBERRY will probably be wagoned through Philadelphia, in the same manner, on its way from Cleveland to the Columbia College School of Mines in the city of New York. In a few years, no doubt, the enormous private palæontological museum of JAMES HALL, of Albany, will be sold to the Yale School of Mines, or the Cambridge Museum, when we might just as well have it for the instruction of our young geologists and mining engineers. One year's income of the Union League would make it the property of teachers of Philadelphia schools, or of the University of Pennsylvania, forever. Such things are not for sale in shops. Such things cannot be got up to order, or furnished by contract. Such things are rare and precious, and if not watched for and secured at the proper time, are lost to us forever. There are not two LESQUEREUX collections, two HALL collections, in the world. Every such collection is special and peculiar to an age and to a country. Other countries cannot copy it—other collectors cannot copy it. Each represents and embodies the life work of a great master and founder of a science; its specimens are classical; they are the types by which all similar specimens are known, and after which they are named; its classification is that of the master's own mind, and according to which his books are written, and his followers in science study. It is a higher honor for a city to possess such a cabinet, so stamped with the impress of a master mind, so historical in its formation, and so classified by its creator, than to have such and such a number of ships in its harbor, or such and such fine store-fronts in its business streets. NUTTALL'S and WILSON'S collection of birds, and MORTON'S collection of craniæ, in our Academy Museum, are glories of this sort to Philadelphia. And such another would have been the great collection of ores, rocks and fossils of ROGERS' Geological Survey, had it not been lost, filched, burned, scattered, and destroyed in detail. No one knows, now, where the residue is; not even a catalogue of it is known to exist. The next survey will have to do the work all over again from the beginning, and the sooner it is begun the better.—*Philadelphia Mining Register.*

BUSINESS AND PERSONAL.

[*Short notices in this column fifty cents per line each insertion.*]

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CHARLES ROGERS, Solicitor and Manager.

In connection with the publication of the ENGINEERING and MINING JOURNAL and the MANUFACTURER AND BUILDER, we have frequently received applications from subscribers and patrons to act as their agents in transacting business with the United States Patent Office; and in view of the increasing number and urgency of such requests, we have resolved to add this department to our business. We have accordingly organized

A COMPLETE PATENT AGENCY,

and now offer our services in procuring patents in this and foreign countries, and transacting all business relating to the obtaining of patents.

Being possessed of superior facilities, in connection with our associate attorneys in Washington and foreign countries, for the successful prosecution of this business, we do not hesitate to guarantee satisfaction to all who may entrust their business to our care.

We have engaged as solicitor and manager Mr. CHARLES ROGERS, a well-known expert in this department. Being a practical mechanic, and having been an examiner in the Patent Office at Washington for a number of years, besides enjoying an experience of more than twenty years as a solicitor of patents, Mr. ROGERS is intimately acquainted with all the details of the business, both in and out of the office.

The specifications, drawings, etc., prepared in our office, will be found to compare favorably with those prepared by any other establishment, while the intimate acquaintance of our manager with the routine of business in the Patent Office, gives us a decided advantage in managing difficult cases.

We are fully prepared to prosecute Rejected Cases and Cases in Interference and Infringements, and also to procure Reissues and Extensions of Patents.

We can also furnish Models for use in the Patent Office, to parties who may desire it, as we have made arrangements for this purpose with one of the most skilful machinists in this country, who possesses every facility for getting up models in the most perfect manner, at short notice, and on reasonable terms.

We shall give special attention to the prosecution of Rejected Applications, which have been improperly prepared by the inventor or incompetent attorneys.

We shall be ready at all times to furnish all necessary information and advice to intending applicants, and give our opinion as to the patentability of their inventions, free of charge; and we make it a rule never to take charge of a case unless we see a reasonable probability of obtaining a patent without first giving the inventor our candid opinion as to the probable result of the application.

OUR CHARGES.

Our charges are as moderate as those of any other responsible patent attorneys, as will be seen from the following figures: For preparing a case (whether simple or complicated) and attending to its passage through the Patent Office, our fee is from $30 to $40, which includes all the necessary papers and drawings. If the application is rejected we make no further charge, but prepare all necessary amendments, and, if requisite, appeal to the Board of Examiners-in-Chief. Most Patent Attorneys make an additional charge on each adverse action of the Patent Office, but we have found it more satisfactory to all parties interested to make our full charge at first; and as we expect no contingent fees, it is to our interest to prepare our cases properly at the commencement, thus avoiding annoyance to ourselves and delay in getting out the patent.

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For first Government fee, stamp, etc.	$16
" our fee	$30 to 40
" final Government fee	20
Total	$66 to $76

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In advance, on receiving the case	$10
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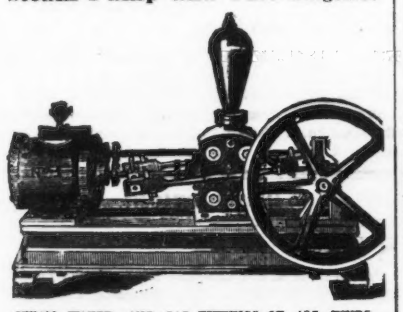

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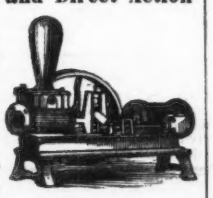

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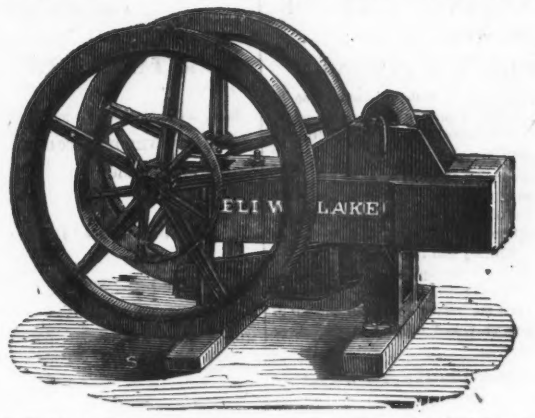

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This machine has now been in use, enduring the severest tests, for the last ten years, during which time it has been introduced into almost every country on the globe, and is eve ywhere received with great and increasing favor as a labor-saving machine of the first order.
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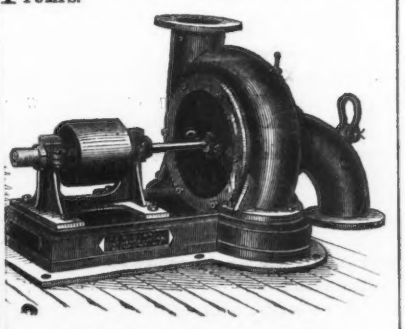

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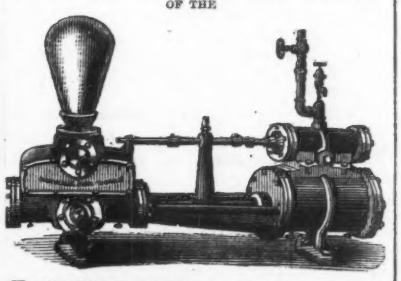

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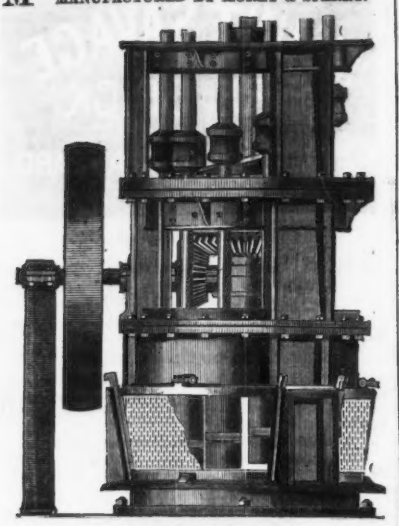

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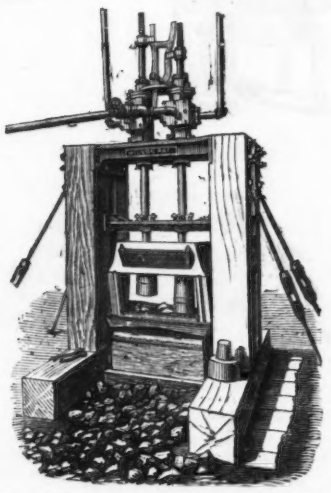

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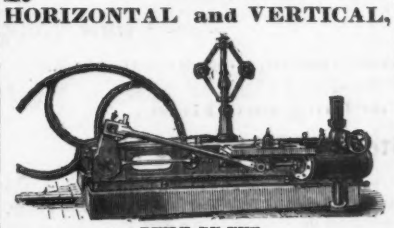

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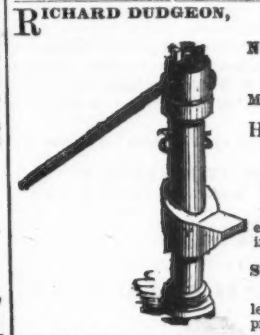

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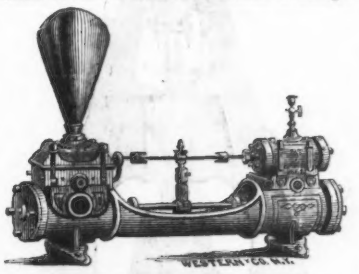

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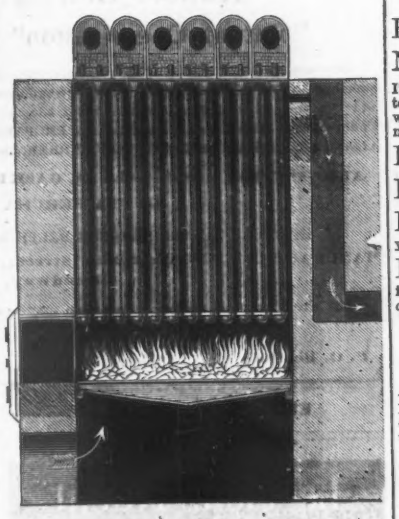

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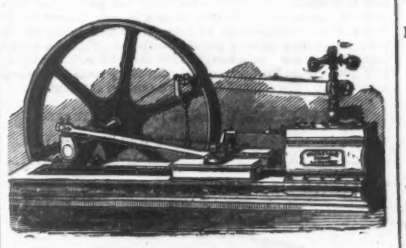

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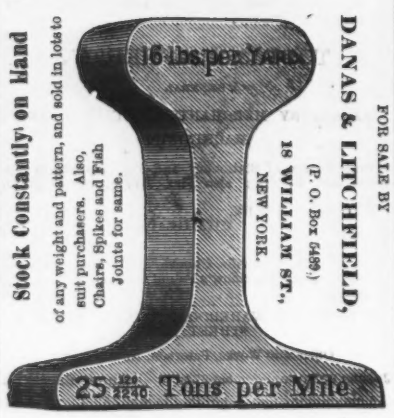

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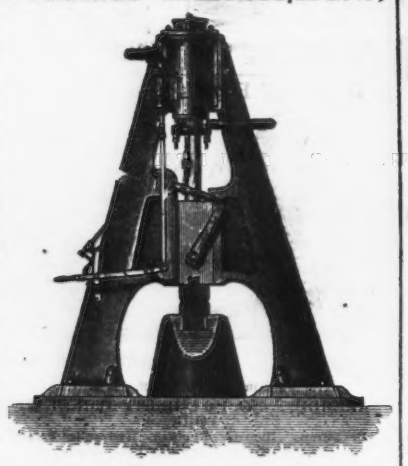

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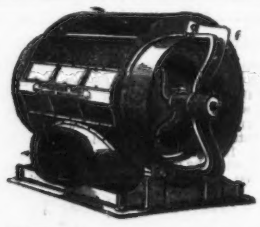

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